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CAMPBELL TIMBER SALE

Draft Environmental Impact Statement

Campbell Timber Sale

Draft Environmental Impact Statement

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Alaska Region

Alaska

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Abstract: This Draft Environment Impact Statement describes the effects of five "action" alternative approaches and one "no action" approach to harvesting timber in the Campbell Study Area.

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Chapter 1

Introduction and Purpose and Need

Chapter 1

Introduction and Purpose and Need

Introduction

This Environmental Impact Statement (EIS) has been prepared by the Stikine Area of the Tongass National Forest. In it we describe five alternatives for timber harvest and the development of a transportation system in the Campbell project area. A "no action" alternative is also described as well as the expected outputs and environmental effects of all six alternatives. The purpose of this draft is to allow you the opportunity to comment on the document and the decision that Gail Kimbell, the Forest Supervisor, must make. This document is organized into four chapters:

Chapter 1, Purpose and Need describes the purpose, background information and key planning issues for the project.

Chapter 2, Alternatives describes the various alternatives and summarizes the consequences of each alternative on the key planning issues.

Chapter 3, Affected Environment describes the existing situation and the ecology of the project area.

Chapter 4, Environmental Consequences predicts the effects of implementing each alternative on the key planning issues and ecological systems.

Background

As managers of the Tongass National Forest, we are guided by several laws including the Multiple Use Sustained Yield Act of 1960. This law requires us to manage for a sustained supply of water, recreation, fish, wildlife and forest products. More specific management direction is provided by the Tongass Land Management Plan, or TLMP, which further defines the locations and conditions of uses on the Forest. Each project planned on the Forest then undergoes a specific planning process guided by the National Environmental Policy Act (NEPA). This process leads to the document you are now reading which discloses the effects of implementing the project.

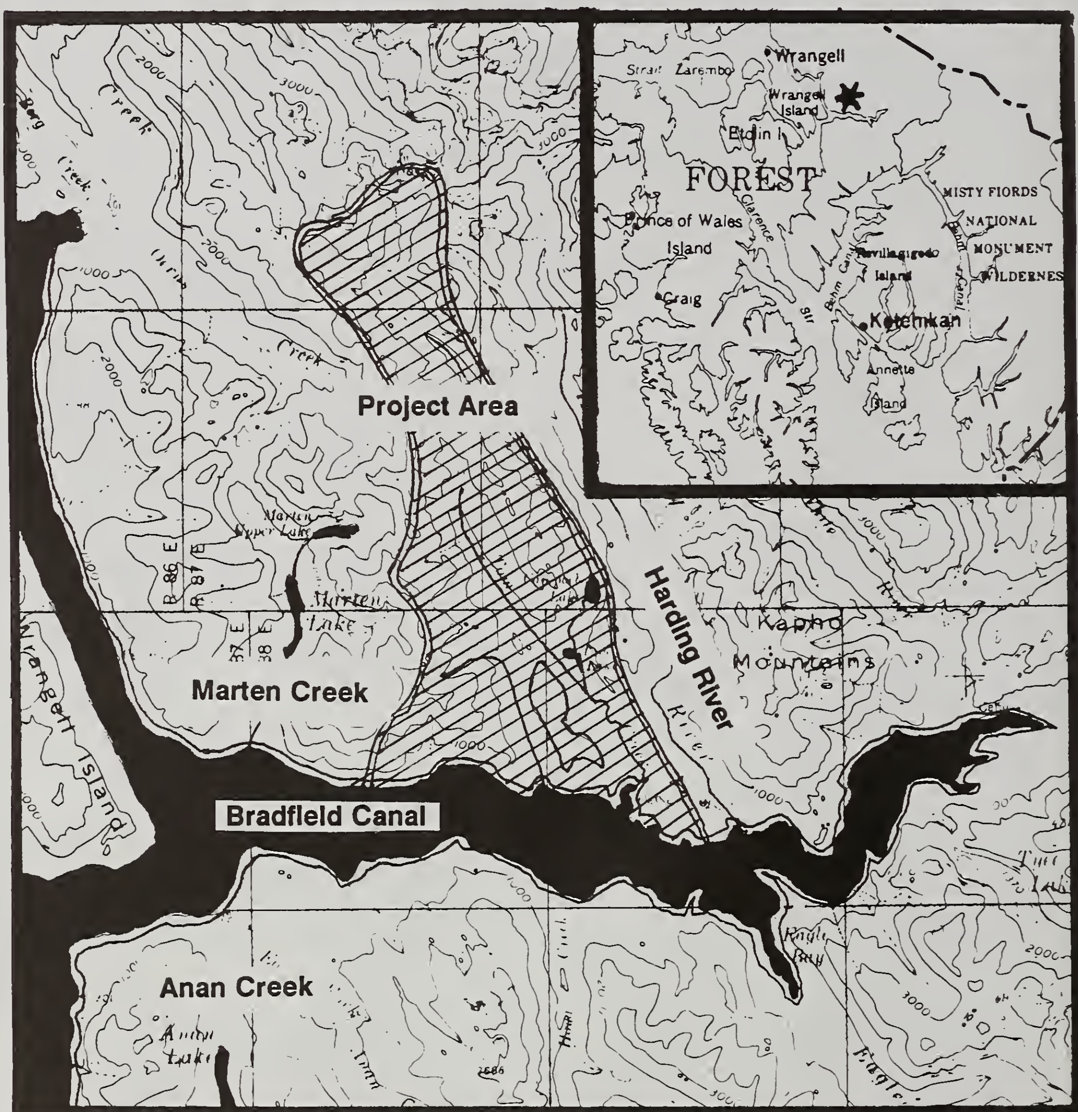
In 1983, we analyzed the Campbell project area for timber harvest and produced a Environmental Assessment (EA) and a decision to clearcut approximately 14 million board feet of timber on 675 acres. In 1983, impacts on the environment were expected to be insignificant. Today, following new policies and guidelines, we must conduct a higher level of analysis and produce an Environmental Impact Statement (EIS), because of the size of the roadless area potentially impacted by the project and the potential for significant effects on the environment. This early analysis is part of the planning file for this sale.

1 Purpose and Need

Project Area Location

The Campbell Timber Sale Study Area is located in Southeast Alaska on the north shore of the Bradfield Canal southeast of the town of Wrangell, Alaska. The study area includes the entire Value Comparison Unit (VCU) 510 but the actual area being considered for timber harvest includes approximately the southern 1/3 of the VCU (See Figure 1-1).

Figure 1-1 Project Area Map



Purpose and Need For The Project

The purpose of this project is to consider specific alternatives to harvest timber within the project area given the guidance in the Tongass Land Management Plan which presently directs us to manage the area for timber production. The need for harvesting timber and managing future timber production is to provide wood products and the opportunity for jobs.

Proposed Action

At the start of the planning process we defined a "proposed action." This serves as a starting point for the planning process and lets the public and other agencies know more about the project we are considering so you can comment. The "proposed action" is not necessarily our "preferred alternative." The proposed action is simply a starting point.

The proposed action for the Campbell Timber Sale is to remove approximately 8 Million Board Feet of timber from the project area with a helicopter. To accomplish this, a road system, sort yard, logging camp and one or more Log Transfer Facilities (LTF's) will likely be needed in the project area. In this document, other alternatives which meet the purpose and need are also considered as well as the "no action" alternative.

Decision To Be Made

The Stikine Area Forest Supervisor, Gail Kimbell, will decide; a) whether to harvest timber from the project study area; b) how much volume to make available to contractors; c) the location and design of harvest units, Log Transfer Facilities (LTF's), roads and a logging camp; and d) the mitigation measures or any enhancement opportunities for resources in the project area.

Forest Service Planning Method

When timber sale project planning begins, we designate a group of professionals with a variety of educational backgrounds to a team known as an "Inter-disciplinary Team" or "IDT." This team conducts the planning process, writes this document and informs you and the decision-maker of the alternatives and the environmental consequences. Another responsibility of this team is to work with the public and the various State and Federal agencies to plan the best project possible.

Ecosystem Management

Ecosystem management is both a process and a product. The process of ecosystem management encourages us to understand the interrelationships between people and the often intricate web of natural processes which are occurring in and around the forest. The more we understand these relationships the better we are able to use the products of the land without affecting the capacity of the system to produce future products. The ecosystem management concept is also broad enough to include man's stewardship of the land for reasons that do not directly benefit people.

The Campbell planning team has tried to incorporate the concepts of ecosystem management into this project by examining the project area within the context of the surrounding landscape. We have tried to describe the systems and ecology of the area not just the resources. Also, we have examined this action within the context of possible future actions and conditions (see "Desired Future Condition" section). If you have read several Environmental Impact Statements before, you may find that this one is structured differently as a result of the approach we used to conduct the analysis.

Your Role in Planning This Project

Because people are an important part of ecosystem management, people must be involved in the project planning process. We began the public notification process by publishing a Notice of Intent in the Federal Register on April 21, 1992. We also mailed over 300 individuals and agencies on the Stikine Area mailing list a letter describing the proposed action, project location and tentative issues. Twenty-five persons responded to this initial announcement of the project and were helpful in refining the key planning issues. In August, we conducted a four day "open house" so the general public could discuss the issues and preliminary alternatives with us more informally.

The main purpose of this ***Draft Environmental Impact Statement*** is to allow you to comment further on the proposal now that you have more information on the effects of the alternatives. Public comments received on the draft will be addressed in the ***Final Environmental Impact Statement*** which will include a decision on the selected alternative.

Other Agency Involvement in Planning This Project

In July and August, we conducted two field trips to the study area with representatives from the Alaska Department of Fish and Game, Fish and Wildlife Service and Alaska Department of Environmental Conservation. The purpose of these trips was to discuss the planning issues and preliminary alternatives. In addition, if an action alternative is selected, the Forest Service is responsible coordinating the following reviews:

US Army Corp of Engineers- Approval to dredge or fill materials into the coastal waters of the United States under Section 404 of the Clean Water Act.

Environmental Protection Agency- National Pollution Discharge Elimination System Review under Section 402 of the Clean Water Act.

State of Alaska, Department of Natural Resources- Tideland Permit and lease or easement.

State of Alaska, Department of Environmental Conservation- Solid Waste Disposal Permit and Certificate of compliance with Alaska Water Quality Standards under Section 401 of the Clean Water Act.

State of Alaska, Coastal Zone Consistency- The Alaska Coastal Management Program (ACMP) developed under the Coastal Zone Management Act requires federal agencies to design their activities to be compatible with approved State management guidelines to the maximum extent practicable.

State of Alaska, State Historic Preservation Officer- Compliance with Section 106 of the National Historic Preservation Act, a process to determine the potential effects of "action" alternatives on cultural resources.

Overall Management Direction For the Project

The Forest Plan

The management direction for the project area is established by the Tongass Land Management Plan. Presently VCU 510 is allocated to a "LUD IV" for the intensive development of natural resources with a primary emphasis on commodity or market values.

The Tongass Land Management Plan is presently being revised. The new Forest Plan will give new management direction to the project area. At present, the Draft EIS for the Tongass Land Management Revision has alternatives which allocate the project area to a wide spectrum of possible land uses including Primitive, Semi-Primitive, Scenic Viewshed, Modified Landscape and Timber Production. Therefore, under this project analysis we decided to provide a range of alternatives which would not foreclose on implementing the Revision Alternatives in case a decision on the new Forest Plan was made during our analysis. We also used some of the standards and guides from the Revision when they were compatible with the present Forest Plan.

Desired Future Condition

The "desired future condition" is based on the guidance in the Tongass Forest Plan and helps describe what conditions we would like to have in the project area in the future...not just for this project but others that may follow. We describe the desired future condition for VCU 510 in terms of desired conditions for six ecological zones.

The overall desired condition for the Campbell project area is a long-term, beneficial interaction between people, their needs and the environment. Ecological systems are sustained and manipulated in order to provide for long-term human needs. These needs include timber, the traditional harvest of fish and wildlife, quality recreation and a better understanding of our past. No more than two to three timber harvest entries are foreseen within an extended rotation of 120-150 years.

There are six groups of ecological systems within the study area which we called "zones." From lowest to highest elevations, they include the ***marine*** zone, the ***saltwater influence*** zone, the ***freshwater influence*** zone, the two upland zones: the ***interior uplands*** and ***saltwater-facing uplands*** and lastly, the ***alpine/brushy slope*** zone (see Figure 1-2). Each zone has a different set of interactions between soil, water, vegetation, animals, fish and people. Therefore, each zone has different ways of meeting the long-term needs of people and different desired conditions over time. Below we describe the desired condition that all the alternatives for harvest move us toward. There are three zones that support timber harvest; the Freshwater Influence, Saltwater Uplands and and Interior Uplands. In the descriptions below we describe the percentage of these three zones that may ultimately be harvested over time (the "rotation") and convert old growth into younger forest. These percentages were calculated by taking the number of suitable and accessible lands in each zone (See Chapter 3, Table 3-8) and dividing by the total acreage in the zone. In the uplands, we subtracted the upland acres that we allocated to the management of old growth habitats.

Marine Zone Desired Conditions

Definition- In the Marine Zone lie areas below mean higher, high tide including estuaries. This zone is managed in cooperation with the State of Alaska and other Federal agencies.

Description- The desired condition is to maintain high quality marine and estuary habitats for a variety of life. Facilities will be located away from areas which provide important habitats for marine life. Impacts to the estuaries and intertidal areas will be minimized. Important cultural resources are located within this zone and will be studied and protected from development activities. Commercial, sport and subsistence fishing will continue to be an important need met in this zone. An increase in land management activities coupled with increased recreation visitation will result in higher traffic levels within the Bradfield Canal and the marine zone.

FIG. 1-2, ECOLOGICAL ZONES

Saltwater Influence Zone Desired Conditions

Definition- In the Saltwater Influence Zone are areas which are influenced by saltwater from mean higher, high tide to 500 feet slope distance or 1000 feet slope distance from estuaries. This is the smallest zone. There are 857 acres representing 3% of the study area within the Saltwater Influence Zone.

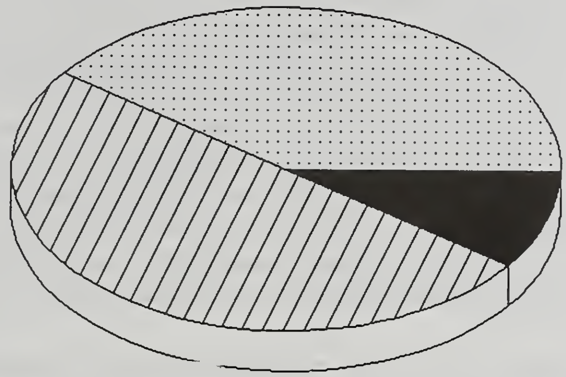
Description- The desired condition of this zone is to provide high-quality beach habitats for wildlife, including shorebirds, waterfowl, bald eagles and big game. The perpetuation of old growth stands of trees is the desired vegetative condition upland of the high tide line. Grasses, sedges and other vegetation on tidal flats will be maintained as forage for a variety of wildlife. Transportation facilities can be built in this zone but will be located away from the mouths of anadromous fish streams, minimize clearing of trees or tidal vegetation to minimal practicable widths and be located in areas having lesser value for marine life and vegetation. Coastal recreation will emphasize natural settings and minimize changes to existing opportunities. Facilities may be noticed by visitors but will be low profile and blend into the natural landscape. A high concentration of historic and cultural resources is located within this zone. These resources will be inventoried and protected and may be interpreted.

Freshwater Influence Zone Desired Conditions

Definition- In the Freshwater Influence Zone lie areas which affect or are affected by fresh water year around. The largest parts of this zone include Tom, Frank and Campbell Creeks and their associated lakes, wetlands and tributaries. Although influenced by rainfall, unmappable channels and runoff areas are not included in this zone. This zone is very important for fish and wildlife habitat and travel. This zone connects all the other zones to each other and is also most influenced by other zones. Historically, the streams and open wetlands of Tom and Frank Creek have made travel into the densely vegetated landscape easier for both people and wildlife. In more modern times, these areas are key to boat and foot access for recreation, hunting and fishing. This zone is the second largest in size with 6,378 acres representing 23% of the study area.

Description- The desired condition of this zone is to maintain or improve the health and condition of freshwater aquatic, riparian and wetland ecosystems. High-quality habitat will be protected for fish and riparian-associated wildlife species. Vegetation types will continue to vary widely primarily due to a natural range of soil drainage conditions. Forested areas represent approximately 60% of this zone. The remaining 40% of this zone is composed of muskegs, other wetlands and water bodies. Eighty percent (80%) of the forested areas (or 50% of the zone) will be in an old growth condition while up to 20% of the forested area (or 10% of the zone) will be in younger age classes in order to provide vegetative diversity, forage for wildlife and timber (see Figure 1-3). These younger forested areas will be dispersed and located in the southern third of the VCU. A variety of trees (size and vigor) will be left in younger stands to provide structural diversity nesting habitat, brown bear bedding areas and channel/soil stability over time. Multi-storied and multi-aged stands will dominate in areas managed for timber. This zone will continue to provide key areas for travel by wildlife between zones and the adjacent watersheds of Marten Creek and the Harding River.

Figure 1-3, Desired Vegetative Composition of the Freshwater Influence Zone



Fish habitat protection or improvement will be emphasized by maintaining stream bank stability, water quality, large wood, pools and stream beds for resident and anadromous fish. Management will minimize disturbance of the unique and sensitive ravines underlain with fine-textured deposits along Frank and Tom Creeks. If roads are needed to benefit future management opportunities, they will most likely be located within this zone. Roads will be designed to best maintain soil and water systems, wildlife habitat/travel and reduce construction costs. Protection measures will be considered to reduce motorized traffic effects on wildlife and minimize changes to current recreation settings and experiences along Tom and Frank Creeks.

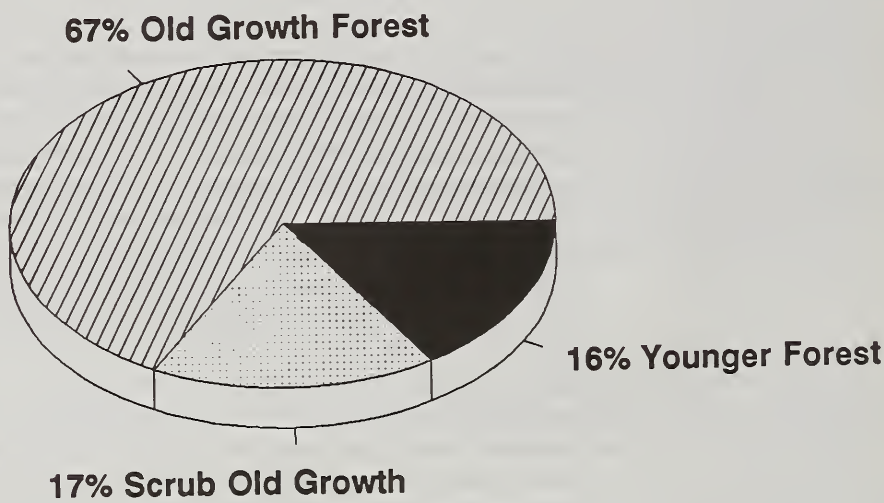
Existing and traditional foot or boat access for recreation, hunting and fishing will remain the same or improve. Boat travelers on Tom and Frank Creeks will notice few changes in the natural setting but foot travelers in the muskegs and wetlands along these streams will notice timber harvest areas in uplands surrounding this zone. Upland harvest may dominate some views in the wetland travel corridors of Tom Creek and most of the corridor of Frank Creek. Due to the importance of this zone for travel and access, opportunities to learn about and interpret cultural, ecological and applied management practices will be pursued.

Saltwater-facing and Interior Uplands Desired Conditions

Definition- The saltwater-facing uplands include uplands which generally drain directly into saltwater and face the Bradfield Canal. This is the second smallest zone with 3,258 acres representing 11% of the project area but containing 50% of the lands which are suitable and accessible for timber production. Interior uplands face into Frank, Tom or Campbell Creeks and drain into their associated tributaries, wetlands and lakes. These uplands contain 6,082 acres representing 21% of the study area, Although these uplands are larger in size than the saltwater uplands, they only contain 22% of the lands for timber production. In both zones, timber producing areas are generally scattered and isolated by steep slopes or rock cliffs. Roads construction is limited, so harvest is primarily dependent on aerial logging systems.

Description- Up to 16% of the uplands (40% saltwater and 9% interior uplands) will be managed in multi-storied, multi-aged stands interspersed with the remaining 84% of the upland zones in forested old growth. Harvest will occur on suitable areas in the southern part of the VCU and will help meet market demand for timber products and increase the productivity of these areas for sawlogs (see Figure 1-4). Harvest will seek to concentrate units within an area when possible to minimize habitat fragmentation and improve harvest economics. Soil productivity will be maintained by applying Best Management Practices in all areas. The tree species mix will remain close to existing proportions. Forested areas which are harvested will contain a mix of uneven-aged, two-storied and some even-aged stands. Harvested upland areas next to saltwater and freshwater influence zones may leave some trees (variety of sizes and vigors) for vegetative diversity, nesting habitat and soil stability. Management of young stands will focus on producing larger, more valuable trees for sawlogs. Saltwater-facing uplands will maintain migration corridors between goat winter range and summer range and seek to retain some valuable goat winter range characteristics in areas surrounding cliffs along the steep, west face of the VCU.

Figure 1-4, Desired Vegetative Composition of the Uplands



The upland zones are rarely visited by travelers but more often viewed from marine or freshwater zones. Visitors to the Bradfield Canal may notice harvest units but they will borrow their shape and texture from the surrounding landscape. Visitors traveling within the drainages of Tom and especially Frank Creek may see a more modified landscape. Research and monitoring designed to learn about and interpret ecological and applied vegetation management practices will be pursued.

Alpine/Brushy Slopes Desired Condition

Definition- Approximately 40% (11,125 acres) of VCU 510 lies within the alpine or brushy slopes zone. This zone provides important summer range habitat for many species of wildlife and is determined by the dominant vegetative composition of rock and alpine/brush plant communities.

Description- The desired condition of this zone is the maintenance of habitat for alpine-associated wildlife species and migration corridors between the alpine and upland zones. Migration between the Campbell VCU and the adjacent VCU's of Martin Creek and the Harding River will also be maintained. Although management activities will rarely directly affect alpine areas they should seek to maintain current access and minimize disturbance during mountain goat kidding and hunting seasons. Recreation and hunting experiences will offer a high degree of risk and challenge.

Key Planning Issues

Although there are often many issues associated with the planning of a timber sale, the National Environmental Policy Act directs us to analyze in detail only those issues which are significant. This ensures that the bulk of the analysis effort and the document remains focused on the issues which are most important to the project. We identified ten issues through the public participation process which form the basis for the alternatives:

Issue One

The effects of the transportation system and harvest proposals on the productivity and function of the freshwater system.

The freshwater influence zone is a key component of the Campbell area. This zone is a link to all other zones and provides key access and habitat for many species of fish and wildlife. We will evaluate the alternatives and their affect on riparian and wetland systems by considering the number of riparian and wetland forest acres harvested, impacts of roads on wildlife corridor values, and the amount of wetland impacted by roads. Potential risks to the aquatic system will be measured by the length of stream channels affected by harvest, length of road built and number of stream crossings, proportion of harvest in the watershed and the potential indirect effects of increased access by fishermen. We will also discuss the mitigation measures used and predict their effectiveness.

Issue Two

The effects of the transportation system on the productivity and function of beach areas.

None of the alternatives propose any harvest units within the beach fringe and estuary buffers. However, we will evaluate the direct effects of developing and operating Log Transfer Facilities, roads, sort yards and rockpits within or near these areas on eagles and other wildlife. The alternatives will be compared by the number and location of LTF's, and the length and timing of potential disturbance. Mitigation measures will also be described.

Issue Three

The effects of different methods and locations of log entry on marine fish and shellfish productivity.

Under the various alternatives we could drop logs directly into saltwater, on to a barge and/or construct Log Transfer Facilities. In total, three LTF's could be needed. The degree of influence each of these facilities on intertidal and subtidal areas will be evaluated using the Alaska Timber Task Force (ATTF) siting guidelines and by describing the amount of volume which will be handled at each site; a factor in predicting the amount of bark deposition on the marine bottom.

Issue Four

The effects of harvest proposals on species conservation.

By modeling and measuring the effects on a variety of management indicator species, Threatened, Endangered or Sensitive species, the various locations of old growth blocks, the degree of fragmentation, influence on important corridors and potential vegetative diversity we will quantify and evaluate how the alternatives respond to species conservation concepts. Potential cumulative effects on wildlife species will also be discussed under this issue.

Issue Five

The impacts of harvest proposals on goat winter range, disturbance of kidding and rearing areas and travel corridors.

Goats are a high interest species within the Bradfield area. A modeling and field verification process helps identify high quality habitat areas for goats. We will evaluate the alternatives by measuring the amount and quality of goat habitat impacted by harvest in the study area and the surrounding landscape. We will also describe the impacts to vertical travel corridors. We will use helicopter guidelines to minimize impacts to goat kidding and rearing areas and describe their potential effectiveness.

Issue Six

The Impacts of harvest and roads on brown bear habitat and harvest both during and after logging.

Brown bears are another special interest species in the Bradfield. We will evaluate the alternatives' relative effects on key travel corridors, amount and quality of habitat harvested and road density. We will also analyze the effects of disturbance during logging and the potential increase in access for hunters.

Issue Seven

The effects of harvest proposals on soil productivity.

One of the main concerns addressed by this issue is the potential for landslides and soil displacement. We will evaluate the responsiveness of the alternatives to this issue by determining the number of acres harvested and roads constructed by soil hazard class. Alternative harvest methods will also be evaluated by their relative ability to retain soil stability over time. A description of the predicted vegetative response will also be examined as part of this issue.

Issue Eight

The effects of the proposal on cultural resources and other social values in and around the study area.

Past and present uses of the area by humans reveals a pattern of "human habitats" over time. We will evaluate the relative impact that each alternative has on this pattern by evaluating potential impacts to cultural resources, hunting and fishing, the number and kinds of changes to recreation places as well as changes to the existing visual condition of the area. Changes in the potential use of the area for Outfitter and Guides will also be analyzed as well as the relative potential for timber production.

Issue Nine

The effects of a logging camp on recreation use, fish and wildlife.

Factors such as length of road, locations of road, duration of harvest activities and numbers of personnel used to evaluate impacts in Issues 1, 6 and 8 will be used to describe the relative opportunity and access which logging personnel will have to fish and game while on site. The predicted effectiveness of the mitigation measure used to reduce the number of bears taken in defense of life will be disclosed.

Issue Ten

The economic costs and revenues of the proposals with expensive aerial logging systems being used.

The relative economic efficiency of the alternatives will be used to assess the responsiveness to this issue. We will use estimated costs and returns to the government to compare alternatives.

Issues Outside Scope of This Analysis

Several issues emerged during public involvement and interdisciplinary team meetings which could not be addressed with this project analysis. We listed them below and explain the reasons why they are beyond the scope of this analysis.

Bradfield Road Proposal- The Bradfield is an area containing many options for roads to and from Canada or Ketchikan. Many different options are proposed from roads crossing the project area to a ferry system from the end of a road at the mouth of the Bradfield River. The effects of implementing any one of these possible road alternatives combined with the effects of this potential timber sale could not be examined in detail under this analysis. Under NEPA, we are required to examine potential cumulative effects for this action and "reasonably foreseeable actions." The Bradfield Road proposals are not "reasonably foreseeable" because proposals are vague and it is not certain when or if any of these roads will be built. We do describe changes that could occur as a result of these road proposals under Planning Issues #4 and #8 but we can not quantify the cumulative effects at this time. The Bradfield Road will need to undergo its own NEPA analysis when proposals and timelines are more concrete. This analysis would quantify the cumulative effects of past, present and foreseeable actions.

Forest Plan Amendment- It was suggested during public involvement that some people did not think the study area should support a timber sale now or in the future. Current Forest Plan direction allocates the study area to a LUD IV which emphasizes timber production. An alternative to change the allocation to a LUD II or LUD III could have been considered by the Regional Forester as part of this project level analysis. Due to the fact that the Forest Plan is currently being revised, alternative management allocations for the Campbell study area are best evaluated at the Tongass National Forest planning level in order to evaluate all effects of a change in management direction for this area. The Supplement to the Draft EIS for the Tongass Land Management Plan does evaluate non-development oriented alternatives for the study area. The interdisciplinary team has also passed on site specific information contained in this project level analysis to the Forest level planning team. In this project level analysis, Alternative A (the "no action" alternative") does display the effects of not harvesting timber at this time.

Market Demand- The market demand for timber sold off the Tongass National Forest is determined at the regional level through the Forest Planning process because the market for timber is regional in scale. Therefore, a single sale can not be evaluated for its response to market demand except in the case of very small sales (for example, <1 MMBF) where the market would be determined by a limited number of small, usually local, operators. Whether or not a sale is sold is often the best indicator that a sale is responding to market demand.

Chapter 2

Alternatives

Chapter 2

Alternatives

Introduction

This chapter is useful as a summary of the planning process and the effects of the various alternatives on the key issues. The following sections are included:

Alternative Development- In this section we describe the process we used to generate the alternatives.

Alternatives Eliminated from Detailed Study- We eliminated one alternative and several potential Log Transfer Facilities from detailed study. In this section we will explain our rationale.

Alternatives Considered In Detail- In this section, we describe each alternative and the strategy utilized to address the issues.

Mitigation Measures- In this section we describe the mitigation measures which we propose to implement with all action alternatives. These measures are either required by law or are measures we have chosen to implement in order to avoid impacts.

Comparison of the Alternatives- We will summarize the effects of the alternatives on the key issues within a table format where you can easily compare the tradeoffs among alternatives. The amount of harvest within each ecological zone will also be shown.

Forest Service Preferred Alternative- In this section we will identify a preferred alternative.

Alternative Development

When we develop a range of alternatives two primary factors are important; the "purpose and need" for the project must be satisfied and the issues developed through public participation must be addressed. Public comments and suggestions are important to us.

How We Used Public Comments in the Alternatives

In addition to using the public comments to focus our analysis on the key planning issues, we also incorporated specific concerns into some or all of the alternatives. For example, there was some support for investigating alternatives to clearcutting (removing all the trees) in harvest units for a variety of reasons. These reasons included scenic quality, wildlife concerns or "mimicking natural regeneration processes of the forest." We responded by incorporating other harvest methods in all alternatives.

Public comments were used to develop the issues, alternatives and mitigation measures.

Another frequent comment we received was the concern that the harvest volume mentioned in the "proposed action" was not sufficient to justify the expensive helicopter systems necessary to log the sale. We responded by incorporating several alternatives that log more than the 8 MMBF described in the proposed action and attempted to make the sale as economical as possible given the strategy of each alternative. Some comments were also incorporated into the design or mitigation measures for all alternatives. For example, there was some concern expressed over the location of a logging camp in the area and the possible impacts to brown bear safety. We responded by requiring a floating camp for all alternatives in order to minimize conflicts between bears and loggers.

The preliminary alternatives were tested.

Once we had developed a preliminary range of alternatives we showed them to several persons inside and outside the Forest Service. This helped us find out if were "on the right track" and had considered a reasonable range of alternatives. This process also helped us refine the alternatives and make them better.

Ecosystem Management and Alternative Development

"Ecosystem Management" ultimately comes back to people...people's values and needs and people planning activities on the land. Therefore we think public involvement and the interdisciplinary team approach are critical to ecosystem management. By focusing on key, integrated issues, we think the alternatives more naturally reflect the real tradeoffs instead of pitting "resources" against one another. By incorporating the ecological zones we can provide you with more information about how ecological systems will be affected by the alternatives.

The alternatives were developed by responding to key issues and considering different ecological zones.

We also think that an important part of ecosystem management is showing you what vegetation we intend to leave in the forest as well as what vegetation we propose to harvest with each alternative. We will also discuss how the area may be managed over time even though this EIS only makes decisions about this immediate proposal. By taking a long-term perspective we can better understand how decisions we make today will affect future options.

The more we studied the key planning issues and the Campbell area the more it seemed to us that the alternatives should vary by their geographic context. The alternatives respond to the planning issues by harvesting and retaining areas in different zones and in different geographic areas. For example, one alternative harvests in Frank Creek and retains areas in Tom Creek.

Alternatives vary in the area harvested or retained and the transportation system used.

The transportation system needed varies widely among alternatives depending on how each alternative addresses the issues. The specific boundaries of the harvest units did not vary among alternatives because we were able to design the harvest boundaries or change the harvest method to address specific site concerns.

Alternatives Eliminated from Detailed Study

An alternative to only harvest in Tom Creek was dropped because of wildlife impacts and poor economics.

Initially we developed Alternative C to only harvest timber within the Tom Creek watershed and retain areas along the saltwater face. This alternative was designed to minimize forest fragmentation by harvesting in areas already dissected by muskeg openings. However, this alternative had a high impact on key wildlife habitat and corridors. Also, suitable areas for harvest are so scattered that three miles of road was needed to harvest only 5.7 MMBF. Due to the impacts of the proposal and the poor economics of timber harvest, this alternative was dropped from further study.

Several LTF sites were dropped from further study.

Eight sites for Log Transfer Facilities were evaluated by the planning team. Only three sites (one within each geographic area) were carried forward into the alternatives. The other five sites were dropped for the following reasons;

We dropped two sites at the mouth of Frank Creek from further consideration. The first was located right at the mouth of the creek, adjacent to an eagle nest tree. This site also required us to cross the creek with a long bridge because the LTF was located on the west side of the creek. The other site was located at the mouth of another small fish stream just east of Frank Creek. We felt these two sites had more environmental effects than the third Frank Creek site which was incorporated into the alternatives.

The third site dropped from further study was located just outside what is commonly referred to as "hollywood bowl" roughly half way between Frank and Tom Creek. This site had few fishery concerns but accessed little volume because a road was not feasible from this location up either Frank or Tom Creeks.

The fourth site dropped was located at the mouth of Tom Creek. The high estuary values, expense of road building and the risk of the road failing directly into Tom Creek were the reasons we dropped this site.

The fifth site dropped was located in the bay just east of Tom Creek. We eliminated this site due to the presence of a cultural site and because this site offered less advantages over a nearby site for log storage.

Alternatives Considered in Detail

This section describes each alternative. We first describe how the alternative was designed to address the issues. Then we describe the acres and units of harvest, the acres of old growth habitat retained and the transportation system which would be needed to log each alternative.

Habitat Managed to Provide Old-Growth Conditions

The current Tongass Land Management Plan, requires that old-growth habitat be provided to achieve wildlife habitat goals. The TLMP provides estimates of the percentage of area in several habitat categories that we anticipate are needed to meet these goals. These areas were identified for each alternative by the team and are displayed on the alternative maps. Since there are different harvest strategies there are also different old-growth management strategies depending on how the alternative responds to the key issues. However, since the Saltwater Influence Zone has the greatest overall value for wildlife, this area was favored for the retention of old growth areas.

Harvest Method Rationale

The Chief of the Forest Service in a letter dated June 4, 1992 has directed that the national forest system will reduce clearcutting by 70% over the next few years. The reduced emphasis on clearcutting, the need to manage a variety of resources in the study area (see Planning Issues, Chapter 1), required planning and layout timeframes, broken topography, isolated patches of suitable timber land and the need to use helicopters, led us to consider different harvest methods in the study area. It became clear to us that old ways of thinking and doing business could give way to the challenge of meeting multiple objectives and resolving conflicts.

Clearcutting was not our preferred method of harvest regeneration.

Traditional harvest in Southeast Alaska relies heavily on clearcutting to regenerate a new stand. Clearcutting usually removes all trees over 9 inches in diameter but yarding with cable systems usually will knock over or uproot most of the remaining trees. This method converts "old growth" which is maintaining or losing wood fiber into young growing trees which are producing wood. Clearly we could have chosen to continue to use more of this type of harvest method and some may wish we did. We favored different harvest methods for the above reasons but want to let you know that there is little concrete data available on what the results will be like. We have used our best predictive abilities to describe what we think will happen.

Overstory removal is the method most used along with group selection and patch-cutting.

Although somewhat experimental, we think that "overstory removal" may offer a way to increase timber productivity over more acres in each entry, manage a larger part of the scenery without creating noticeable "patches," increase the diversity of future stands while reducing leave tree losses to blowdown, improve the economics of helicopter harvest and maintain the stability of the soil over time. If it works, we may have a viable way of harvesting other difficult areas like the Campbell landscape or even more of the landscape. If it fails, we will have learned something for the next time. In this document we have disclosed the effects of both possible outcomes. In some cases (such as the estimates of effects on wildlife) we have modeled the effects of overstory harvest as if it were a clearcut. This discloses the effects under a scenario where all leave trees would be damaged or blow over.

Group selection (less than 2 acres in size) and patch cutting (2-10 acres in size) were our selected harvest method to respond to a specific issue (such as goat habitat or fragmentation) or ways of harvesting timber off forested areas that were patchy or broken by cliffs.

Alternative A

The "No Action" Alternative

This alternative defers any harvest in VCU 510 at this time. It assumes no change in the current management and would propose no further development at this time. This alternative also serves as a basis of comparison for the "action" alternatives.

Alternative B

Would harvest in Frank Creek and reserve areas along the West Face and Tom Creek.

This alternative represents the "proposed action" outlined in Chapter 1. We designed this alternative to harvest timber in the area with the least amount of change to the existing "human habitats" of the west face and Tom Creek. This alternative minimizes fragmentation of the corridor between the study area and the Marten Creek watershed which also minimizes the effects on high quality goat habitat. Under this alternative we favored retaining old growth areas along the West Face to complement this objective (some retained areas could instead be concentrated in Tom Creek to allow a future entry along the West Face). There is only one watershed affected by this alternative which reduces the risk to the freshwater zone and the species of fish and wildlife that rely on it. A single harvest entry is expected in Frank Creek since we propose to harvest most of the suitable areas. The road would therefore be closed and the LTF rehabilitated. The harvest operation is concentrated within a small area which helps reduce logging costs.

Table 2-1, Alternative B Features

Features	Amount/Location
Total Harvest Acres	383 acres
Total Old Growth Retained	950 acres, mostly in West Face and saltwater influence zone.
Potential Future Harvest Entry	Tom Creek or West Face depending on old growth strategy.
Total Harvest Volume	8.8 MMBF
Total Miles of Road	1.3 Miles
Log Transfer Facility	Frank Creek

FIG. 2-1, ALTERNATIVE B

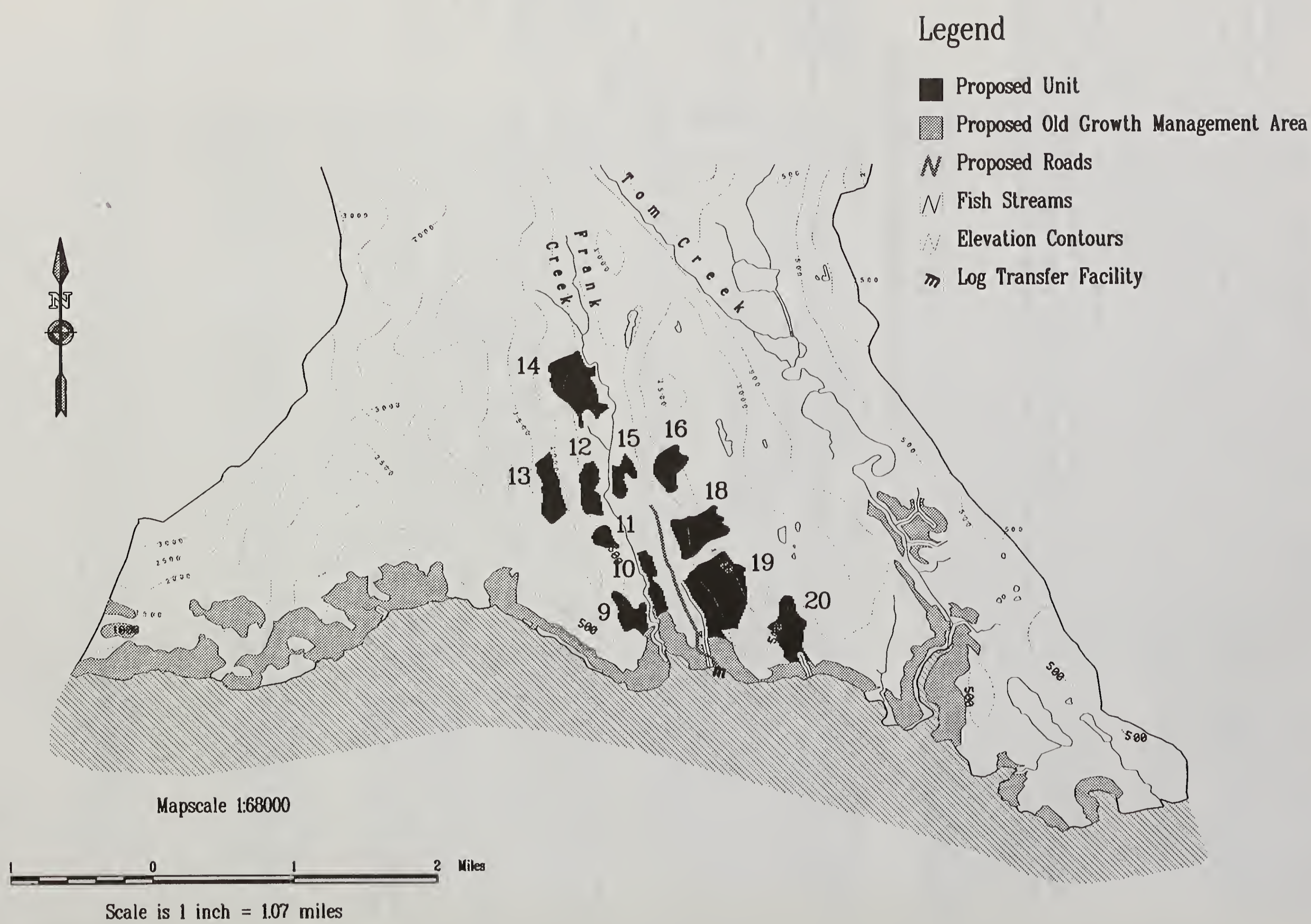


Table 2-2, Alternative B Harvest Units

Unit # and Method	Harvest Area Size	Net Volume
#9, Overstory Removal w/ Leave Trees	28	725 Mbf
#10, Patch Cut	2-5 acre patches totaling 14 acres w/in 24 acre area	350 Mbf
#11, Overstory Removal w/ Leave Trees	13 acres	325 Mbf
#12, Overstory Removal w/ Leave Trees	30 acres	650 Mbf
#13, Overstory Removal w/ Leave Trees	40 acres	972 Mbf
#14, Overstory Removal w/ Leave Trees	73 acres	1512 Mbf
#15, Overstory Removal w/ Leave Trees	20 acres	399 Mbf
#16, Overstory Removal w/ Leave Trees	32 acres	800 Mbf
#18, Overstory Removal w/ Leave Trees	55 acres	1404 Mbf
#19, Patch Cut	8-10 acre patches totaling 30 acres within 111 acre area	660 Mbf
#20, Overstory Removal w/ Leave Trees	48 acres	1092 Mbf
TOTAL	383 acres cut, 474 acres treated	8.8 MMBF

Alternative D

Would harvest the West Face and retain the interior uplands.

We designed this alternative to eliminate the need for roading and have all harvested timber flown by helicopter to a landing, barge or water drop. Areas set aside to retain old growth habitats were located in the interior uplands of Frank and Tom Creek (Figure 2-2 shows the retained areas in Frank Creek but another option could favor retaining some areas in Tom Creek as shown for Alternatives F and G). Risk to the marine and freshwater systems of Frank and Tom Creek are minimized but there would be effects to goat habitat and noticeable changes to the viewshed of the Bradfield Canal because most of the harvest occurs in the saltwater-facing zone. A single harvest entry is expected on the west face since most of the suitable lands are harvested in this zone. The lack of roading and one LTF increases the economic efficiency and reduces the effects on brown bear. The LTF would be rehabilitated. Potential future harvest entries could occur in Frank or Tom Creek depending on alternative strategies of retaining old growth areas over time.

Table 2-3, Alternative D Features

Features	Amount/Location
Total Harvest Acres	490 acres
Total Old Growth Retained	950 acres in Frank or Tom Creek
Potential Future Harvest Entry	Frank Creek or Tom Creek
Total Harvest Volume	11 MMBF
Total Miles of Road	0 Miles
Log Transfer Facility	West Face

FIG. 2-2, ALTERNATIVE D

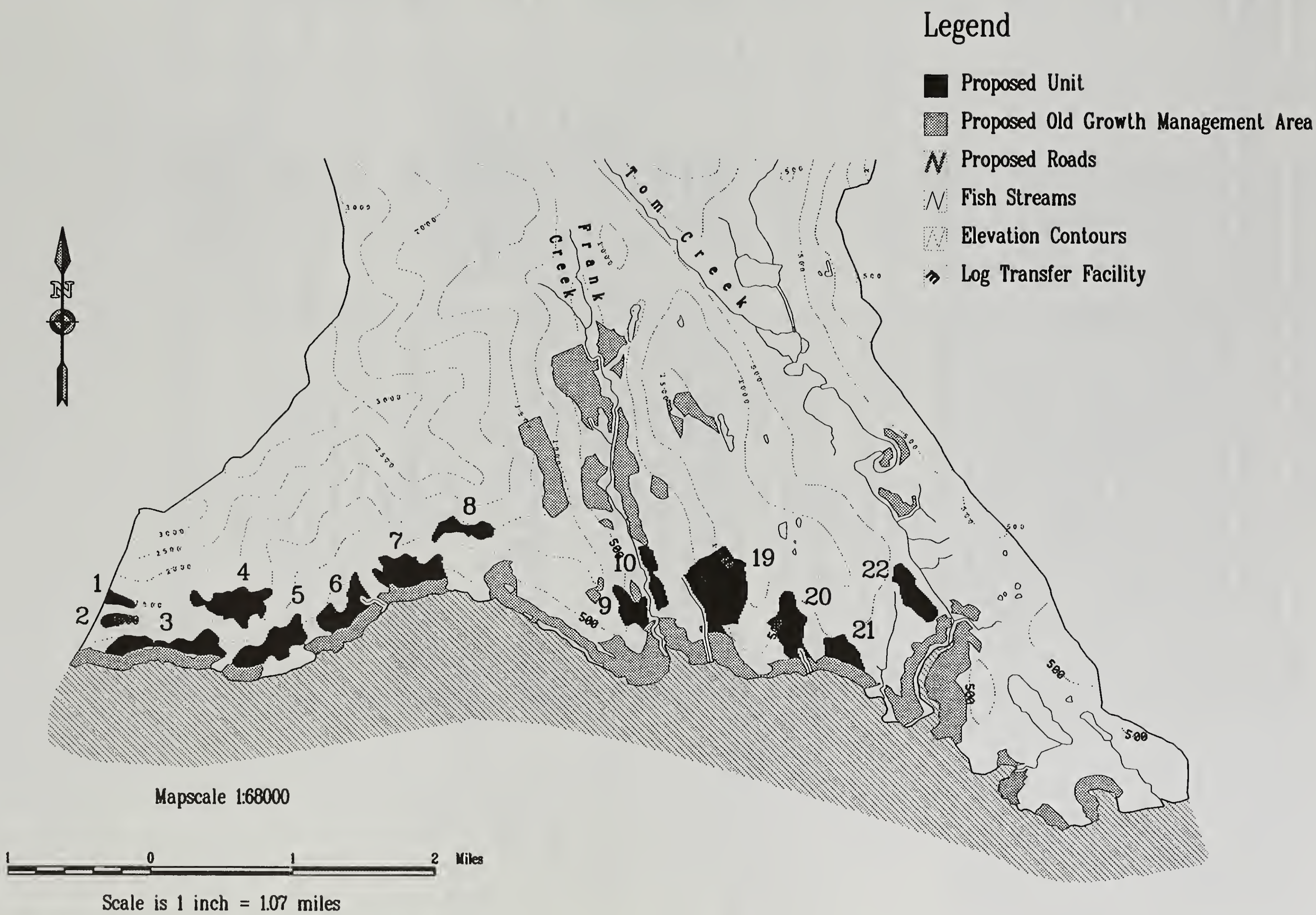


Table 2-4, Alternative D Harvest Units

Unit # and Method	Harvest Area Size	Net Volume
#1, Overstory Removal	10 acres	270 Mbf
#2, Overstory Removal	11 acres	297 Mbf
#3, Overstory Removal w/ Exclusions	52 acres	1080 Mbf
#4, Overstory Removal w/ Leave Trees	58 acres	1350 Mbf
#5, Overstory Removal w/ Leave Trees	55 acres	1352 Mbf
#6, Overstory Removal w/ Leave Trees	41 acres	874 Mbf
#7, Overstory Removal w/ Leave Trees	56 acres	1315 Mbf
#8, Overstory Removal	25 acres	500 Mbf
#9, Overstory Removal	28 acres	700 Mbf
#10, Patch Cut	2-5 acres patches totaling 14 acres within 24 acre area	308 Mbf
#19, Patch Cut	8-10 acre patches totaling 30 acres within 111 acre area	600 Mbf
#20, Overstory Removal w/ Leave Trees	48 acres	1062 Mbf
#21, Overstory Removal	25 acres	529 Mbf
#22, Overstory Removal	37 acres	840 Mbf
TOTAL	490 acres cut, 581 acres treated	11 MMBF

Alternative E

Would harvest the West Face, Frank and Tom Creeks and disperse retained areas.

This alternative disperses harvest and retention throughout the project area. This alternative also represents our view of the maximum area capable of being harvested within the project area under Forest Plan direction, present technology and market conditions. This alternative would fragment old growth blocks within the project area. We would therefore rely on blocks of old growth habitat in the Harding and Marten Creek watersheds to supply the needs for these conditions in the north Bradfield landscape. This alternative would have the most effect on the freshwater and upland zones and therefore a greater effect on wildlife and fish habitat. Because the transportation system required is so extensive, development costs are high and the impacts to the saltwater and marine zones are greatest. Roads would be closed and rehabilitated. This alternative would implement the greatest degree of change to the established pattern of use by people, increase access and benefit those looking for a roaded, hike-in recreation experience. Increased access would affect wildlife populations, particularly brown bears. A single harvest entry would be expected over the entire project area.

Table 2-5, Alternative E Features

Features	Amount/Location
Total Harvest Acres	1007 acres
Total Old Growth Retained	950 acres
Potential Future Harvest Entry	None for Rotation
Total Harvest Volume	22.1 MMBF
Total Miles of Road	4.6 Miles
Log Transfer Facilities	Frank & Tom Creeks & West Face

FIG. 2-3, ALTERNATIVE E

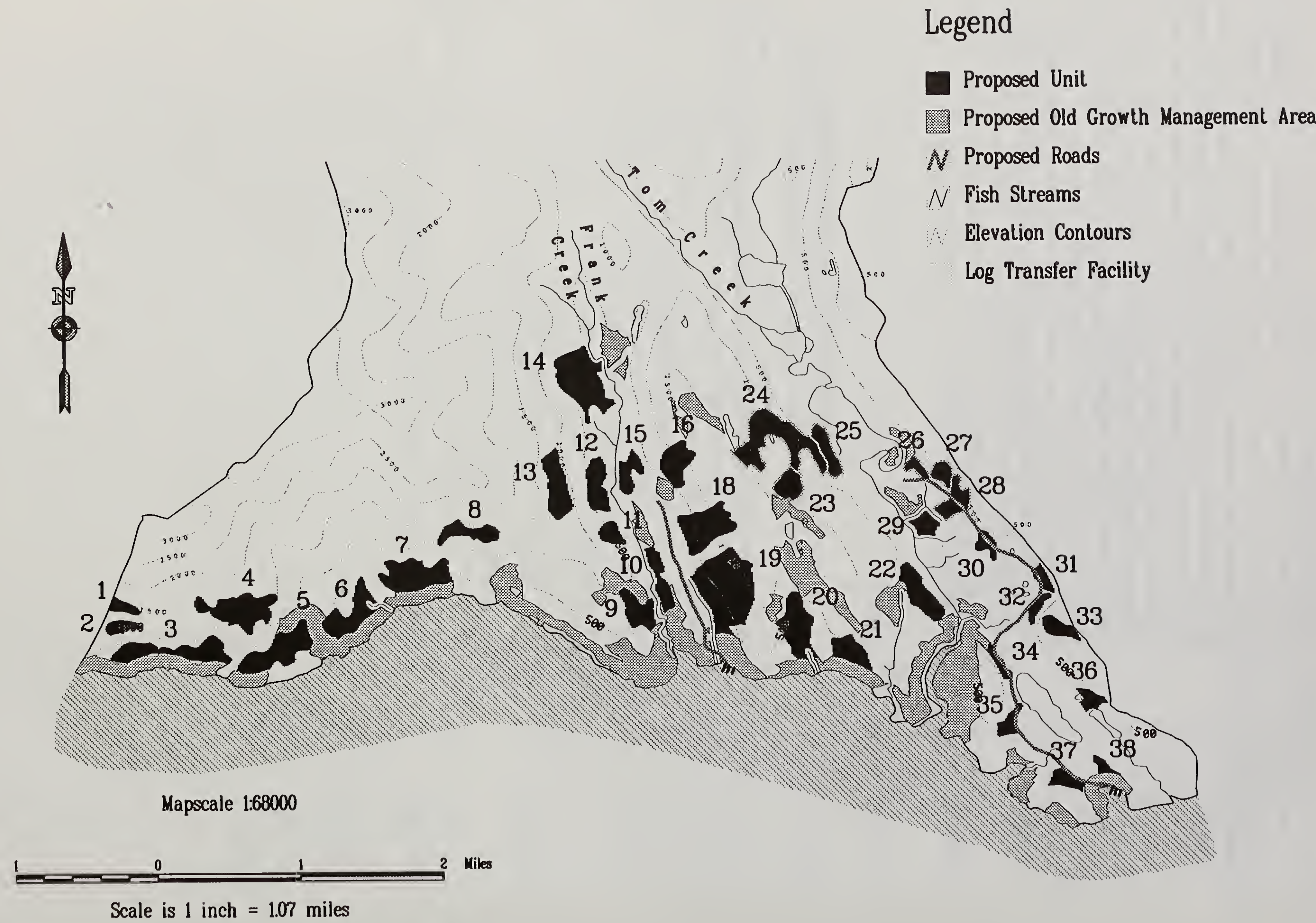


Table 2-6, Alternative E Harvest Units

Unit # and Method	Harvest Unit Size	Net Volume
#1, Overstory Removal	10 acres	270 Mbf
#2, Overstory Removal	11 acres	297 Mbf
#3, Overstory Removal w/ Exclusions	52 acres	1080 Mbf
#4, Overstory Removal w/ Leave Trees	58 acres	1350 Mbf
#5, Overstory Removal w/ Leave Trees	55 acres	1352 Mbf
#6, Overstory Removal w/ Leave Trees	41 acres	874 Mbf
#7, Overstory Removal w/ Leave Trees	56 acres	1315 Mbf
#8, Overstory Removal	25 acres	500 Mbf
#9, Overstory Removal	28 acres	700 Mbf
#10, Patch Cut	2-5 acre patches totaling 14 acres w/in 24 acre area	350 Mbf
#11, Overstory Removal w/ Leave Trees	13 acres	325 Mbf
#12, Overstory Removal w/ Leave Trees	30 acres	650 Mbf
#13, Overstory Removal w/ Leave Trees	40 acres	972 Mbf
#14, Overstory Removal w/ Leave Trees	73 acres	1512 Mbf
#15, Overstory Removal w/ Leave Trees	20 acres	399 Mbf
#16, Overstory Removal w/ Leave Trees	32 acres	800 Mbf
#18, Overstory Removal w/ Leave Trees	55 acres	1404 Mbf

Table 2-6, Alternative E Harvest Units (continued)

Unit # and Method	Harvest Unit Size	Net Volume
#19, Patch Cut	8-10 acre patches totaling 30 acres within 111 acre area	660 Mbf
#20, Overstory Removal w/ Leave Trees	48 acres	1062 Mbf
#21, Overstory Removal	25 acres	529 Mbf
#22, Overstory Removal	37 acres	910 Mbf
#23, Overstory Removal	22 acres	462 Mbf
#24, Patch Cut	5-8 acre patches totaling 40 acres within a 82 acre area.	1000 Mbf
#25, Overstory Removal	23 acres	440 Mbf
#26, Clearcut, High-lead	10 acres	120 Mbf
#27, Overstory Removal w/ Exclusions	13 acres	200 Mbf
#28, Clearcut, High-lead	26 acres	520 Mbf
#29, Clearcut, High-lead	14 acres	280 Mbf
#30, Clearcut, High-lead	12 acres	192 Mbf
#31, Clearcut, High-lead	10 acres	200 Mbf
#32, Clearcut, High-lead	10 acres	160 Mbf
#33, Overstory Removal	16 acres	320 Mbf
#34, Clearcut, High-lead	9 acres	189 Mbf
#35, Clearcut, High-lead	13 acres	234 Mbf
#36, Overstory Removal	13 acres	130 Mbf
#37, Clearcut, High-lead	16 acres	256 Mbf
#38, Clearcut, High-lead	7 acres	112 Mbf
TOTAL	1007 acres cut, 1140 acres treated	22.1 MMBF

Alternative F

Would harvest the West Face and Frank Creek and retain Tom Creek.

The objective of this alternative is to make a single entry into the project area and concentrate retained old growth acres within the Tom Creek watershed. This alternative would fragment existing blocks of old growth within the project area. We would rely on blocks within the Harding and Marten Creek watersheds to supply this habitat in the north Bradfield landscape. This alternative would predominantly affect the west face and the freshwater and upland zones of Frank Creek. There would be a noticeable change in the landscape as viewed from the Bradfield Canal. The road would be closed and LTF rehabilitated. The established pattern of use would remain unchanged in the Tom Creek watershed while roaded, hike-in recreation opportunities would be enhanced in Frank Creek. Since access is not increased in the Tom Creek drainage important brown bear habitat is retained.

Table 2-7, Alternative F Features

Features	Amount/Location
Total Harvest Acres	701 acres
Total Old Growth Retained	950 acres
Potential Future Harvest Entry	None in Rotation
Total Harvest Volume	15.9 MMBF
Total Miles of Road	1.3 Miles
Log Transfer Facility	Frank Creek & West Face

ALTERNATIVE F

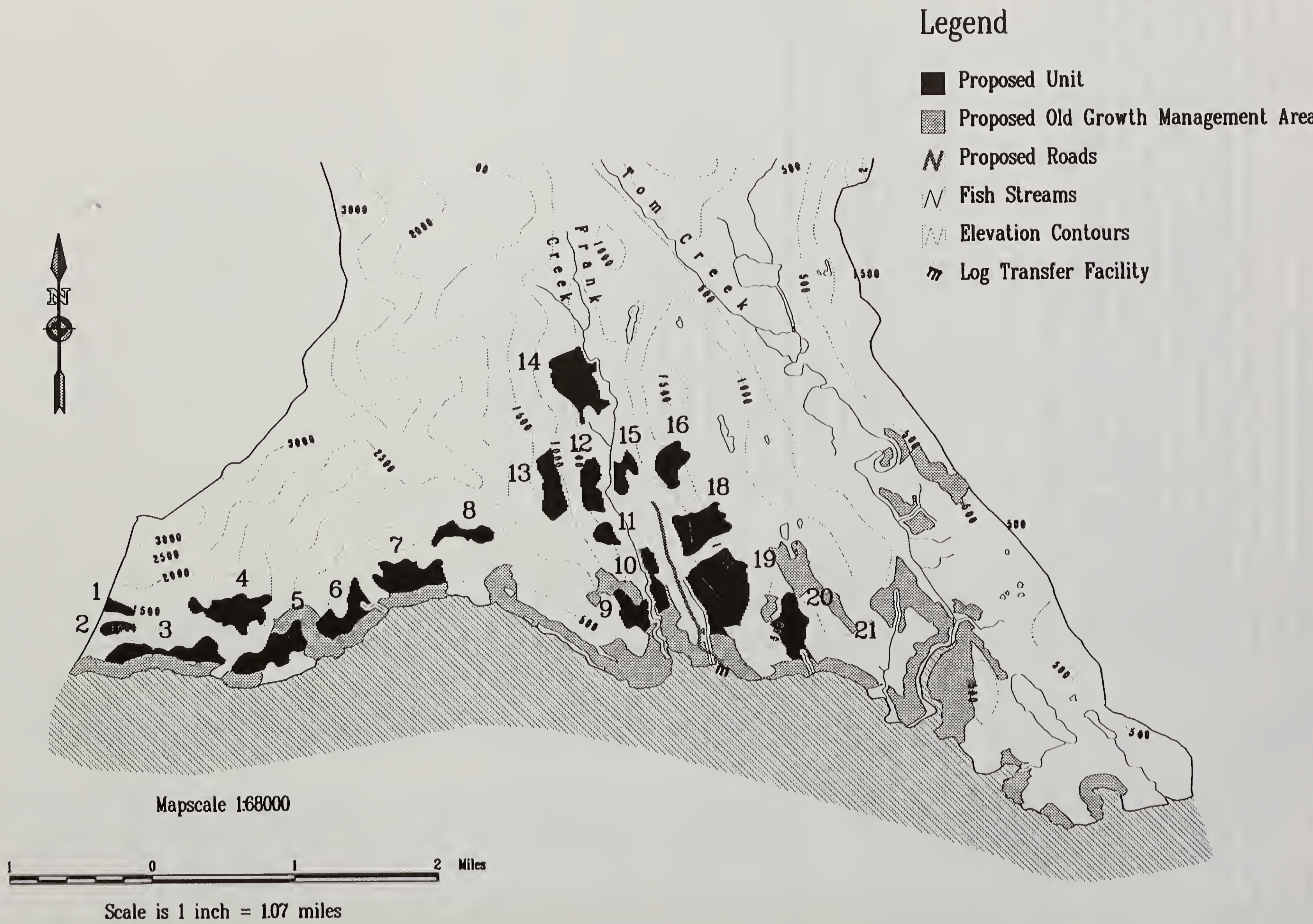


Table 2-8, Alternative F Harvest Units

Unit # and Method	Harvest Area Size	Net Volume
#1, Overstory Removal	10 acres	270 Mbf
#2, Overstory Removal	11 acres	297 Mbf
#3, Overstory Removal w/ Exclusions	52 acres	1080 Mbf
#4, Overstory Removal w/ Leave Trees	58 acres	1350 Mbf
#5, Overstory Removal w/ Leave Trees	55 acres	1352 Mbf
#6, Overstory Removal w/ Leave Trees	41 acres	874 Mbf
#7, Overstory Removal w/ Leave Trees	56 acres	1315 Mbf
#8, Overstory Removal	25 acres	500 Mbf
#9, Overstory Removal w/ Leave Trees	28 acres	700 Mbf
#10, Patch Cut	2-5 acre patches totaling 14 acres w/in 24 acre area	350 Mbf
#11, Overstory Removal w/ Leave Trees	13 acres	325 Mbf
#12, Overstory Removal w/ Leave Trees	30 acres	650 Mbf
#13, Overstory Removal w/ Leave Trees	40 acres	972 Mbf
#14, Overstory Removal w/ Leave Trees	73 acres	1512 Mbf
#15, Overstory Removal w/ Leave Trees	20 acres	399 Mbf
#16, Overstory Removal w/ Leave Trees	32 acres	800 Mbf
#18, Overstory Removal w/ Leave Trees	55 acres	1404 Mbf

Table 2-8, Alternative F Harvest Units (continued)

Unit # and Method	Harvest Area Size	Net Volume
#19, Patch Cut	8-10 acre patches totaling 30 acres within 111 acre area	660 Mbf
#20, Overstory Removal w/ Leave Trees	48 acres	1062 Mbf
TOTAL	701 acres cut, 792 acres treated	15.9 MMBF

Alternative G

Would harvest the West Face (w/ Group Selection) and Frank Creek and retain Tom Creek.

The objective of this alternative is to make a single entry within Frank Creek but regenerate the West Face over time using group selection and retain old growth acres within the Tom Creek watershed. Three harvest entries would be expected on the West Face over time using group selection to remove 1/3 of the timber on suitable lands each time. This alternative would have similar effects as Alternative F except the group selection harvest method would reduce fragmentation of the West Face and effects to key goat habitat during this entry. There would also be little noticeable change in the landscape as viewed from the Bradfield Canal. The road up Frank Creek would be closed and the LTFs rehabilitated.

Table 2-9, Alternative G Features

Features	Amount/Location
Total Harvest Acres	497 acres
Total Old Growth Retained	950 acres
Potential Future Harvest Entry	West Face
Total Harvest Volume	11.6 MMBF
Total Miles of Road	1.3 Miles
Log Transfer Facility	Frank Creek & West Face

ALTERNATIVE G

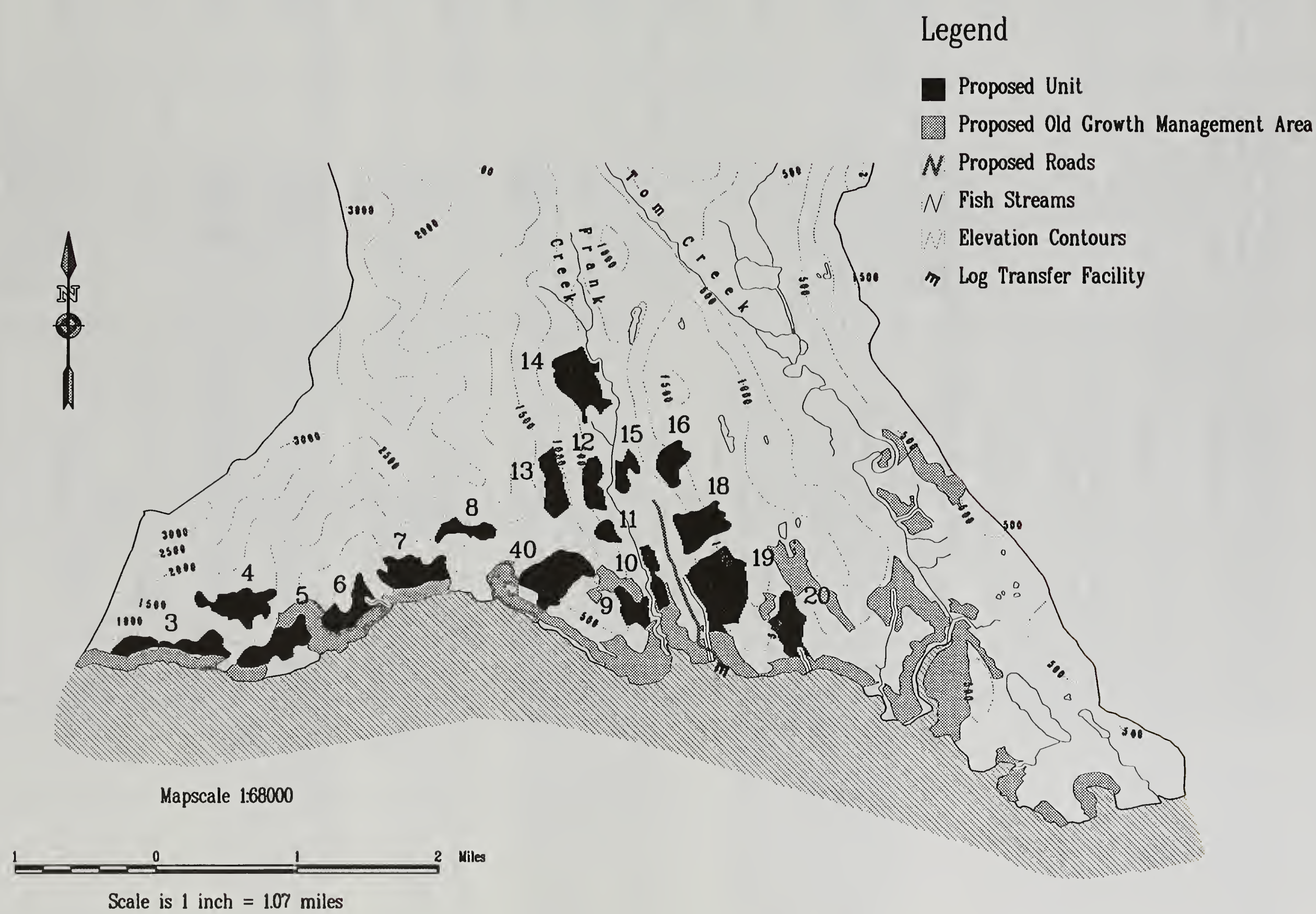


Table 2-10, Alternative G Harvest Units

Unit # and Method	Harvest Acres	Net Volume
#3, Group Selection	17 acres in 52 acre area	435 Mbf
#4, Group Selection	19 acres in 58 acre area	551 Mbf
#5, Group Selection	18 acres in 55 acre area	509 Mbf
#6, Group Selection	14 acres in 44 acre area	364 Mbf
#7, Group Selection	18 acres in 56 acre area	486 Mbf
#8, Group Selection	8 acres in 22 acre area	184 Mbf
#9, Overstory Removal w/ Leave Trees	28 acres	700 Mbf
#10, Patch Cut	2-5 acre patches totaling 14 acres w/in 24 acre area	350 Mbf
#11, Overstory Removal w/ Leave Trees	13 acres	325 Mbf
#12, Overstory Removal w/ Leave Trees	30 acres	650 Mbf
#13, Overstory Removal w/ Leave Trees	40 acres	972 Mbf
#14, Overstory Removal w/ Leave Trees	73 acres	1512 Mbf
#15, Overstory Removal w/ Leave Trees	20 acres	399 Mbf
#16, Overstory Removal w/ Leave Trees	32 acres	800 Mbf
#18, Overstory Removal w/ Leave Trees	55 acres	1404 Mbf
#19, Patch Cut	8-10 acre patches totaling 30 acres within 111 acre area	660 Mbf

Table 2-10, Alternative G Harvest Units (continued)

Unit # and Method	Harvest Acres	Net Volume
#20, Overstory Removal w/ Leave Trees	48 acres	1062 Mbf
#40, Group Selection	20 acres in 82 acre area	240 Mbf
TOTAL	497 acres cut, 843 acres treated	11.6 MMBF

Mitigation Measures

Mitigation measures are used to avoid impacts.

The Forest Service uses a variety of mitigation measures in the design and implementation of timber sales to avoid or reduce impacts to the environment. Some of these mitigation measures are required by law; for example, streamside buffers. Some mitigation measures are included in our policies or the Forest Plan. Other measures are very specific to a location or unit. These actions and their site-specific application are documented on the unit and road cards in Appendix A. Described below are the mitigation measures we will use for this project under all action alternatives.

Cultural Resources

Based on inventory work in the Campbell area and elsewhere in southeast Alaska, we developed a model to locate those areas where cultural resources are likely to be found. In addition to providing a basis for the comparison of alternatives, this model helps identify areas where we will intensively survey for cultural sites prior to any ground disturbing activity. If additional cultural resources are located, appropriate mitigation and protection will be designed in consultation with the Alaska State Historic Preservation Officer.

Wild and Scenic Rivers

The Harding River which lies outside of the project area has been determined to be eligible for inclusion in the Wild and Scenic River System. No harvest or related activities will be occurring within the watershed of this river. We will also protect the scenic values for which this river has been identified as eligible.

Best Management Practices

Best Management Practices (BMP's) are an extensive set of practices and operating procedures for activities conducted on the National Forest. The BMP's are the result of extensive effort between the Forest Service and the State of Alaska to identify practices that will assure timber harvest activities protect water quality to State standards and protect the soil resource. Specific BMP's we will implement for this project are described on unit and road cards in Appendix A.

Stream-Side Buffers

The Tongass Timber Reform Act mandates a minimum 100 foot buffer on all Class I streams and on those Class II streams that flow directly into Class I streams. Lakes are also protected by buffers. Some streamside buffers in this project are wider than 100 feet in response to site-specific conditions such as the stream channel type and the width of the floodplain. Specific information about streamside buffers is located on the unit cards in Appendix A. Past experience has shown that these buffers are effective in providing shading, bank stability and a continued supply of large wood; key elements in maintaining the productivity of the freshwater system.

Marbled Murrelets

Marbled murrelets are known to occur in the waters around the project area. No known nests have been located. If a nest is located, we will implement a minimum 30 acre buffer surrounding the nest. Roads may be built through this buffer only if it is unavoidable and will be located the furthest distance from the nest site.

Goshawks

Goshawks may have been sited in the project area but no nests have been located. The goshawk is not presently classified as Threatened or Endangered nor is it recognized as a Regional Sensitive Species, therefore there are currently no specific standards for protecting goshawk nests or habitat. If a goshawk nest should be found in the study area during this project we will implement the recommendations in the "Interm Habitat Management Recommendations for the Northern Goshawk; Tongass National Forest 1992." A copy of these guidelines is available from the Stikine Area Forest Supervisor's office in Petersburg, AK.

Key Wildlife Habitats

Several mitigation measures are expected to be effective in protecting key wildlife habitats within the project area. Many of the more site-specific mitigation measures are described on the unit and road cards in Appendix A. These mitigation measures include the following:

There is no harvest in beach fringe or estuary areas.

No harvest is scheduled within the saltwater-influence zone. This zone consists of beach fringe and estuary habitats. Minimum clearing widths are employed on all roads and facilities located within this zone. In addition, we located sort yards out of this zone whenever possible.

Areas of suitable forest land are designated to provide old growth habitat.

Blocks of old growth habitat have been designated for each alternative and are shown on the alternative maps. These blocks are designated according to Forest Plan direction and consist of a percentage of the suitable forest land in the project area. Harvest and roading is precluded in these areas which help provide continuous habitat for species which depend on old growth habitat conditions for all or part of their life cycle. More old growth areas are located in areas which are classified as unsuitable for timber harvest.

Roads will be closed after harvest.

All roads built in the project area will be closed at or near their point of origin in order to decrease the opportunity for motorized access after the project is implemented. This measure will be effective in eliminating motorized use including ATV's but will not reduce hike-in use which will have been made easier under alternatives with planned roads. We are using road closures mainly to protect bears and furbearers from increases in hunting and trapping which can happen from increased road access.

Restrictions on the timing of activities will occur in certain areas.

Yarding of units (#1,2,4,8 & 13) located on the West Face will not occur between January 1 through June 30 in order to protect possible goat kidding and rearing areas. Written concurrence from the US Fish and Wildlife Service will be required for repeated flights within 1/4 mile or blasting within 1/2 mile of active eagle nests.

Helicopter guidelines will be used.

Guidelines for the operation of helicopters used to yard logs out of harvest units will be used in the timber sale contract to ensure that wildlife are not harassed by over-flights. These guidelines include; 1) All nests trees will be considered active from March 1 to May 31 and from June 1 to August 31, trees with nests containing young will be considered active. Repeated helicopter flights within 1/4 mile of active eagle nests will be avoided. 2) Helicopters will maintain at least 1,000 foot vertical and horizontal distance from visible mountain goats. There will be no sightseeing of goats. 3) The helicopter operating season at the West Face Log Transfer Facility will extend from May 1 through October 31.

Logging Camp

We will require a floating camp for this sale instead of a land based camp to address concerns over bear-human interactions. A floating camp is an effective method of preventing bears from becoming habituated to food and reducing the loss of bears that are shot in defense of life or property. The contractor will need to obtain the necessary permits from the State of Alaska to ensure compliance with water quality standards.

Comparison of the Alternatives

This comparison of alternatives draws together the conclusions we make from analysis presented throughout this document. Table 2-11 shows the characteristics of each alternative. Table 2-12 describes the amount of activity within each zone by alternative. Table 2-13 compares each alternative to the key planning issues. These three charts enable you to see clearly the tradeoffs between alternatives.

Table 2-11, Alternative Characteristics

Character	Alt.A	Alt.B	Alt.D	Alt.E	Alt.F	Alt.G
Acres Harvested	0	383	490	1007	701	497
Old Growth Acres Retained & Emphasis	N/A	950, West Face & Tom Creek	950, Interior Uplands	950, Dis-persed	950, Tom Creek	950, Tom Creek
Harvest Volume (MMBF)	0	8.8	11	22.1	15.9	11.6
Miles of Road	0	1.3	0	4.6	1.3	1.3
LTF Sites	0	1, Frank Creek	1, West	3, All	2, Frank Creek and West	2, Frank Creek and West

Table 2-12, Activity In Zones

Zone	Alt.A	Alt.B	Alt.D	Alt.E	Alt.F	Alt.G
Marine	None	1 LTF	1 LFT, Barge & Water Drops	3 LTF, Barge & Water Drops	2 LTF, Barge & Water Drops	2 LTF, Barge & Water Drops
Saltwater Influence	None	1 LTF, .3 Miles Road	1 LTF	3 LTF, .7 Miles Road	2 LTF, .3 Miles Road	2 LTF, .3 Miles Road
Fresh Water Influence	None	41 Acres Harvest, 1 Mile Road	83 Acres Harvest	183 Acres Harvest, 3 Miles Road	91 Acres Harvest, 1 Mile Road	66 Acres Harvest, 1 Mile Road
Upland Saltwater-Facing	None	221 Acres Harvest	393 Acres Harvest	609 Acres Harvest, .7 Miles Road	489 Acres Harvest	310 Acres Harvest
Interior Upland	None	121 Acres Harvest	14 Acres Harvest	215 Acres Harvest, .2 Miles Road	121 Acres Harvest	121 Acres Harvest

Table 2-13, Alternative-Issue Comparison Chart

Alternative	Issue One- Freshwater Areas	Issue Two- Beach Areas	Issue Three- Marine Areas
Alternative A	No effect on existing riparian, freshwater aquatic or wetland conditions.	No impacts to beach areas.	No impacts to marine areas.
Alternative B	Harvests 41 acres riparian habitat; impacts wildlife corridor values in Frank Creek; Harvests along 3.5 miles of stream; Builds 1.3 miles of road in Frank Creek watershed; 5 stream crossings; Harvests 9% of Frank Creek watershed; enables increased fishing access to Frank Creek; six acres forested wetlands harvested; 2.6 acres of wetland impacted by road.	Construction and operation of 1 LTF near Frank Creek estuary; estimated duration of activity 1 year.	Uses only Frank Creek LTF which meets six of twelve ATTF guidelines; 8.8 MMBF would be watered.
Alternative D	Harvests 83 acres of riparian habitat mostly along Class III streams; least effect on riparian corridors other than Alt. A; Harvests along 4.3 miles of stream; no road or stream crossings; Harvests 1% of Frank and <1% Tom Creek watersheds...; least risk to fish other than Alt. A; no increased access to Tom or Frank Creek; no wetlands impacted.	Construction and operation of 1 LTF on west face; estimated duration of activity 1 year; least effect overall except Alt A.	Uses only West Face LTF which meets five of twelve ATTF guidelines; 11 MMBF would be watered and dewatered at this site.
Alternative E	Most riparian acres harvested (183); Most effect on riparian corridors especially Tom Creek area; Harvests along 7.1 miles of stream; 4.6 miles of road with 12 stream crossings; Harvests 9% of Frank, and 1% Tom Creek watershed; most risk to fish; increased fishing access to Tom and Frank Creeks; 33 acres forested wetlands harvested; 8.7 acres of wetland impacted by roads.	Construct and operate 3 LTFs; duration of activity 2 years; most impact overall to beach areas.	Uses all three LTF's to water and dewater 22.1 MMBF. 6.2 MMBF watered at Tom Creek LTF site which meets 11 of 12 ATTF siting guide-lines. Other LTF's water/ dewater same as under Alt. F.

Table 2-13, Alternative-Issue Comparison Chart (continued)

Alternative	Issue One- Freshwater Areas	Issue Two- Beach Areas	Issue Three- Marine Areas
Alternative F	Harvests 91 acres of riparian habitat; impacts riparian corridor values in Frank Creek; Harvests along 5.5 miles of stream; 1.3 miles of road in Frank Creek watershed with 5 stream crossings; Harvests 9% of Frank watersheds; second greatest risk to fish; enables increased fishing access to Frank Creek; six acres forested wetland harvested; 2.6 acres of wetlands impacted by roads.	Construct and operate 2 LTFs; duration of activity 1-2 years; second greatest impact on beach areas.	Uses Frank and West Face LTF's to water 8.8 at Frank Creek and water/dewater 7.1 MMBF at west face.
Alternative G	Harvests 66 acres of riparian habitat; impacts riparian corridors in Frank Creek; areas harvested lie along 5.5 miles of stream but west face units are group selection; 1.3 miles of road in Frank Creek watershed with 5 stream crossings; Harvests 9% of Frank watershed; enables increased fishing access to Frank Creek; 26 acres of wetland harvested; 2.6 acres of wetlands impacted by roads.	Construct and operate 2 LTF's; duration of activity 1-2 years.	Uses Frank and West Face LTF's to water 8.8 at Frank Creek and water/dewater 3 MMBF at west face.

Table 2-13, Alternative-Issue Comparison Chart

Alternative	Issue Four-Species Conservation	Issue Five-Goats	Issue Six- Brown Bears
Alternative A	Least effects on species conservation variables.	No effect on present amount and quality of goat habitat and movements.	No effects on present amount of habitat or potential for harvest.
Alternative B	Least effect of action Alts to indicator species; fragments old growth blocks and corridors the least; increases access into Frank Creek.	Least effects on habitat values of action Alts; retains 97% of habitat capability; little effect on vertical corridors.	Retains 98% of original habitat capability with intermediate effects on access due to increased access up Frank Creek.
Alternative D	Intermediate effects to indicator species; intermediate effects to old growth blocks; fragments west face corridor but does not increase human access over time.	Retains 95% of habitat capability; some barriers to vertical migration.	Retains 99% of original habitat capability with no long-term effects on access.
Alternative E	Greatest effects to indicator species; maximum fragmentation of old growth; maximum human access.	Retains 91% of habitat capability; some barriers to vertical migration.	Retains least (96%) of habitat capability; much greater impact from increased access due to road up Tom Creek.
Alternative F	Second greatest effects to indicator species; second ranking in maximizing fragmentation; increased access up Frank Creek.	Retains 91% of habitat capability; some barriers to vertical migration.	Retains 97% of habitat capability; increased access up Frank Creek.
Alternative G	Third greatest effects on indicator species; similar effects to fragmentation as B but slightly greater; increased access up Frank Creek.	Retains 95% of habitat capability; few barriers to vertical migration.	Retains 98% of habitat capability; increased access up Frank Creek.

Table 2-13, Alternative-Issue Comparison Chart

Alternative	Issue Seven- Soil Productivity	Issue Eight-Social Values	Issue Nine- Logging Camp	Issue Ten- Economics
Alternative A	No effect on soil productivity	No effects on present values.	No camp.	No returns.
Alternative B	Low risk of disturbance to soil; some lands out of production; 58 acres harvest on high hazard soil.	Least change in existing areas among action alts; increased recreation access up Frank Creek; Retains existing recreation values up Tom's; 24 acres in high probability cultural area; least visual effects and risk; harvest not noticeable.	Duration and extent of recreation displacement is least of all action Alts; Tom Creek recreation should be unaffected; some opportunity for harvest of fish and wildlife up Frank Creek watershed; duration most limited.	Just below cost at mid-market levels.
Alternative D	Low risk of disturbing soil; fewest lands out of production of all action Alts.; 64 acres harvest on high hazard soil.	Least change in present access pattern; most potential changes occur to Bradfield Canal; retains existing recreation values up Tom's; 68 acres in high probability cultural area; harvest should not be noticeable but high risk to visual resource.	Duration and extent of recreation displacement is slightly more than Alt. B. Least amount of opportunity for harvest of fish and wildlife; duration is slightly more than B.	Greatest positive return.
Alternative E	Some risk of disturbance due to cable logging; most lands out of production; 168 acres harvest on high hazard soil; some road segments in high hazard terrain.	Most change in access and in views up Bradfield and Tom; increased access; 108 acres in high probability area; harvest should not be noticeable from Bradfield but high risk.	Duration and extent of recreation displacement is greatest; most opportunity for harvest of fish and wildlife and greatest risk to bear, and fish populations; duration is the greatest.	Most negative return below cost at mid-market levels.

Table 2-13, Alternative-Issue Comparison Chart (continued)

Alternative	Issue Seven- Soil Productivity	Issue Eight-Social Values	Issue Nine- Logging Camp	Issue Ten-Economics
Alternative F	Low risk to soil disturbance; some lands out of production; 117 acres harvest on high hazard soil.	Changes to Bradfield and Frank Creek landscape; increased recreation access up Frank Creek; retains existing recreation values in Tom's; 44 acres in high probability area for cultural resources; combines visual effects of Alts B and D.	Duration and extent of recreation displacement is intermediate; recreation up Tom Creek should be unaffected; opportunity to harvest fish and wildlife up Frank Creek; duration is greater than Alt. B & D but less than Alt. E.	Positive economic return.
Alternative G	Low risk to soil disturbance but some risk of blowdown; some lands out of production; 117 acres harvest on high hazard soil.	Changes to Bradfield will not be noticed; retains existing recreation values up Tom's; 44 acres in high probability area for cultural resources; visual effects similar to Alt. B.	Similar effects to recreation, fish and wildlife as Alternative F.	Second most negative return below cost at mid-market levels.

Forest Service Preferred Alternative

Alternative F is the FS preferred.

To recommend the preferred alternative, the Forest Supervisor evaluated the benefits and impacts of each alternative and gave particular consideration to how each alternative responded to the significant issues. Alternative F is tentatively identified as the preferred alternative.

Chapter 3

Affected Environment

Chapter 3

Affected Environment

Introduction

In this chapter we describe the environment that will potentially be modified by this project. We feel that the information in this section is not only important documentation for this potential harvest entry but future management activities as well. As the environment is modified from its existing condition it is important for us to understand and document the baseline condition. This chapter is divided into two main sections:

Watershed Characteristics- In this section we describe the key components of the ecosystem and the general characteristics of VCU 510.

Ecological Zones- We describe the environment further in terms of six ecological zones in order to illustrate the relationship between the ecosystem components described in the previous section. The ecological zones also help make the tie between the ecosystem being described and the planning issues.

Watershed Characteristics

We describe the ecology of the area by beginning our discussion with the corner stones of the Southeast Alaska landscape; geology, soil and water. Building on these three basic components, we go on to describe the fish, vegetation, wildlife and finally the past and present people that depend on these elements of the ecosystem.

The Corner Stones: Geology, Soil and Water

The Campbell study area has bedrock material which is different than that occuring around it on the mainland. Folded, metamorphic rock gives the area a steep, broken terrain and orientation. In addition, glacial lakes of long ago likely formed the unique and deep sand deposits found in the valleys. Streams further divide and dissect this landscape. The geology, soil and water patterns in turn lead to a heterogeneous, matrix of vegetation and habitats for wildlife and people.

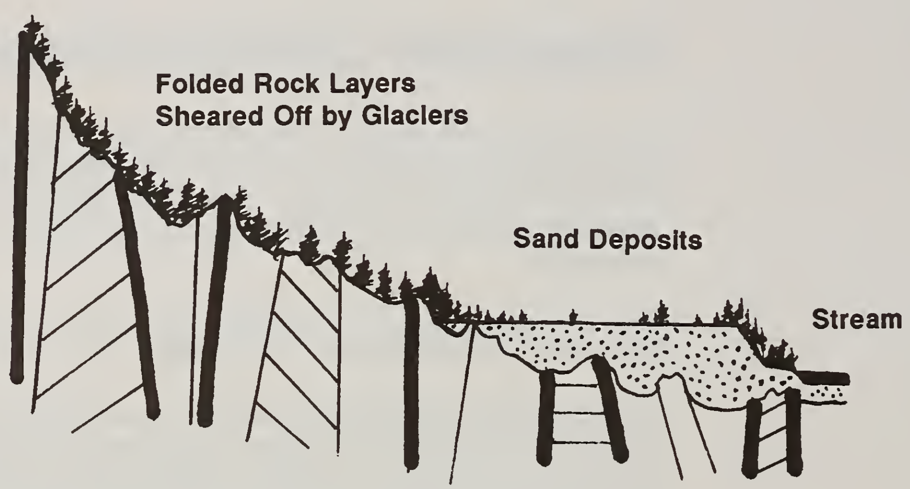
Geology and Soil

The Campbell study area is within a belt of highly metamorphosed rocks, predominately gneiss and schists, that lie in a northwest-southeast direction. This metamorphism lies adjacent to igneous rocks (also referred to as plutons and batholiths) predominantly quartz-diorite, diorite, and granite, which occur on either side of the study area: in the Martin Creek watershed to the west, and in the Kapho mountains on the east side of the Harding River.

Vertically folded rock gives the area its broken terrain & NW-SE orientation

The structure and distinct foliation of this metamorphic bedrock has a strong influence on the appearance and management suitability of this landscape. The landforms developed in this material are very irregular and broken mountain slopes with a corresponding pattern of soil types and plant communities. The nearly vertical orientation of the bedrock produces a complex of soils types reflecting drastic differences in soil depth, composition and steepness within short distances. Figure 3-1 illustrates some of the important terrain formation factors in the study area; folded metamorphic rock which was sheared off by glaciers and deep sediments of sand formed by glacial lakes which were later carved into by streams.

Figure 3-1, Terrain Formation Illustration



Soils vary widely in type and depth.

This soil landscape pattern typically consists of very shallow soils on short steep escarpments near vertical cliffs. Deeper soils have developed in colluvial material on moderately steep concave slope positions or by weathering from bedrock. A few soils have developed in the scattered remnants of glacial till material plastered against the valley sidewall. Both Tom and Frank Creek valleys have a U-shaped profile characteristic of glacially carved valleys. Valley bottoms are relatively flat with valley sidewalls of steep forested slopes rising abruptly from the valley floor to the extensive areas of rounded, glacially scoured alpine.

The glacial valleys are filled with deep sand deposits.

The lower valley of both Tom and Frank Creeks are filled with glacio-fluvial deposits, mostly stratified sand and silt (See Figure 3-2). The location, extent, and horizontal stratification of this material suggests that it was formed in-place by sedimentation of a glacial lake to an elevation of about 280 feet above present sea level. The glacial lake was likely formed by glacial ice and debris in the Bradfield Canal fiord impounding melt waters from the uplands in the Tom and Frank Creek watersheds. This theory is supported in part by the deposits of glacial marine till at the mouths of Frank and Tom Creeks. Source of this sediment is thought to be from the rapid erosion of fresh glacial deposits immediately after or during the process of deglaciation of these upland valleys about 8000 years ago. As the remaining glacier retreated up the Bradfield Canal these glacial lakes drained and Tom's Creek quickly and easily cut into the soft sandy sediments. This left high, steep banks which are still a source of sandy sediment in Tom Creek.

Figure 3-2, Likely Extent of Glacial Lakes Responsible for Sand and Silt Deposits

Sand deposits are highly erosive.

This type of soil material presents a challenge to management since it is highly erosive if the protective vegetation is removed. Cutbanks are highly unstable and subject to erosion unless mitigative measures are applied.

Timber harvest affects soil temperature and productivity.

Soil development in the Campbell Study Area is strongly influenced by high precipitation and cold soil temperatures. Under these conditions, organic matter decomposes slowly and tends to accumulate on site. Tree rooting is generally very shallow, even on deep soils. Roots are generally present in the surface organic layers and the upper few inches of mineral soil. Typically this rooting zone is never dry, is very acid, and contains most of the nutrients available for plant growth. Soil productivity and nutrients can be affected by timber management. Removing the canopy of trees allows increased solar radiation to penetrate and warm the soil. Increased soil temperature accelerates microbial activity and nutrient cycling, thus increasing the availability and use of soil nutrients, particularly nitrogen, by vegetation. The result is an abundance of rapidly growing forbs, shrubs, and tree seedlings. Consequently, the net annual biomass production is greater than it was in the old growth forest. This effect is relatively short lived and tends to diminish as the young forest stand closes canopy and again shades the soil surface.

The upper, soil layers are important to productivity.

Since most of the soil nutrients are in the upper organic-rich layers, destruction or removal of these surface layers will have a severe adverse effect on tree growth. This can occur by landslides, surface erosion, severe burning, yarding disturbance, or by displacement by roads, skid trails, landings, or rock pits. Also, soil damage can occur by compaction or puddling, which prevents soils from draining, decreases the rooting depth, and thus reduces productivity. The allowable limits of these kinds of soil disturbance are described in the Region 10 Soil Quality Standards (FSM 2554 R-10 Supplement 2500-92-1, 1/15/92).

Most undisturbed soils on Campbell Study Area are very resistant to surface erosion. Thick layers of surface organic matter and surface mats of vegetation act as protective covers that minimize surface erosion. Most soils are subject to erosion however, if the protective surface layers are removed. This is especially true of the glacial sediments in the lower valleys. These materials, when disturbed by landslides or undercut by streams, often become chronic sources of sediment.

In the natural setting, soil mass movement is the dominant erosional process. Most landslides occur during, or immediately after, periods of heavy rainfall when soils are saturated. Soils that are prone to landslides are typically on steep slopes and have distinct slip-planes such as compacted glacial till or bedrock sloping parallel to the surface. When subjected to heavy rainfall, these areas have a high likelihood of mass movement, especially if disturbed by blasting of rock pits or road pioneering, side casting of excavated material, or logging practices that cause substantial surface disturbance.

Tree roots stabilize slopes.

Recent research on landslides in Southeast Alaska (Swanston 1989) has concluded that although over 90 percent of all landslides in the past 20 years were not directly caused by logging or roads, logging and roads do increase the potential for landslides in a given site. Vegetation, tree roots in particular, have a stabilizing effect on slopes. Strength of tree roots tend to decrease significantly four to seven years after the tree is cut. This decrease in soil holding capability results in an increased likelihood of soil movement on steep slopes following clearcutting. Further, the displaced roots of uprooted trees can disturb the soil mantle whenever windthrow occurs. Under natural conditions, windthrow is an important triggering device of debris avalanches and flows in Southeast Alaska.

The broken terrain makes landslides uncommon.

In the natural setting, large landslides are uncommon in the Campbell study area. This is due in part to the broken uneven terrain with relatively stable soil materials on upper slopes. Recent landslides on upper mountainslopes tend to be infrequent and of small size. Areas with frequent landslide scars are generally associated with the glacial material on the lower valley sideslopes and along the incised stream systems. A planning level stability analysis of the study area was done based on the Soil Resource Inventory of the Stikine Area.

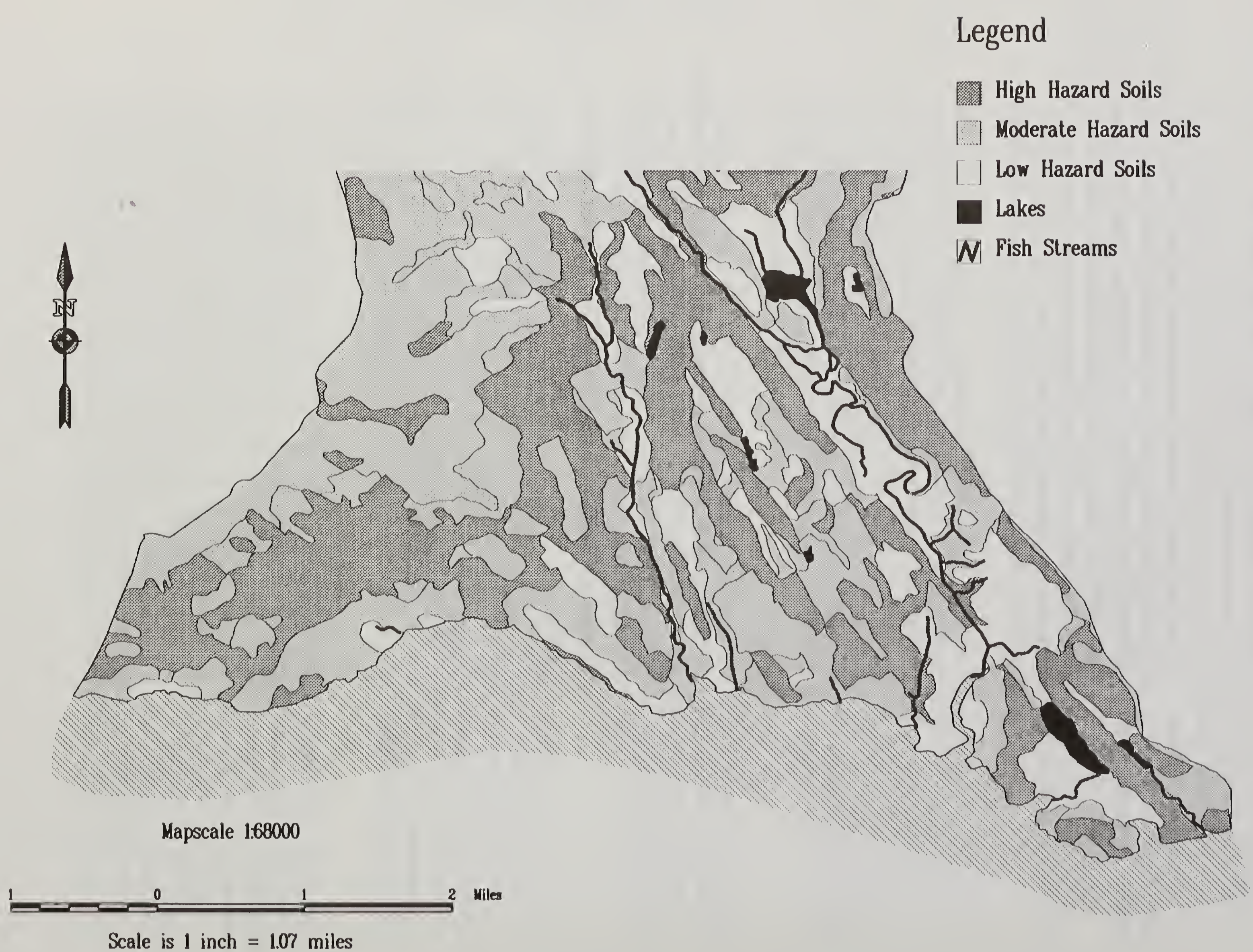
There is a high percentage of high hazard soils in the study area.

Landslide hazard classes are used to group soil map units that have similar properties regarding the stability of natural slopes. Three classes; high, moderate, and low; rank soil units according to their relative potential for mass wasting (Table 3-1). The relatively high proportion of high hazard soils, (35% of the study area), is typical of steep mainland landscapes. Figure 3-3 shows the location of high hazard soils in the southern portion of the study area.

Table 3-1, Distribution of Soil Hazard Classes in the Campbell Study Area

Soil Hazard Class	Acres	Percent
Low	5,032	18%
Moderate	12,968	47%
High	9,700	35%

FIG. 3-3, SOIL HAZARD CLASSES



Water

The Campbell analysis area includes 17 watersheds whose streams terminate at saltwater, creating a total watershed analysis area of 27,700 acres with 104 miles of inventoried streams. Table 3-2 below illustrates some of the characteristics of a few of the watersheds in the Campbell analysis area.

Table 3-2, Brief Descriptions of Some Analysis Area Watersheds.

Watershed Name or Description	Area in Acres (sq.miles)	Total Stream Length (miles)	Drainage Density (mi./sq.mi.)
Tom Creek	19,065 (29.8)	72.7	2.44
Frank Creek	3,290 (5.14)	10.0	1.95
Smallest Watershed	51 (0.08)	0.41	5.21
Largest Watershed	19,065 (29.8)	72.7	2.44
Smallest Drainage Density	329 (0.52)	0.45	0.88
Largest Drainage Density	56 (0.09)	0.51	5.85

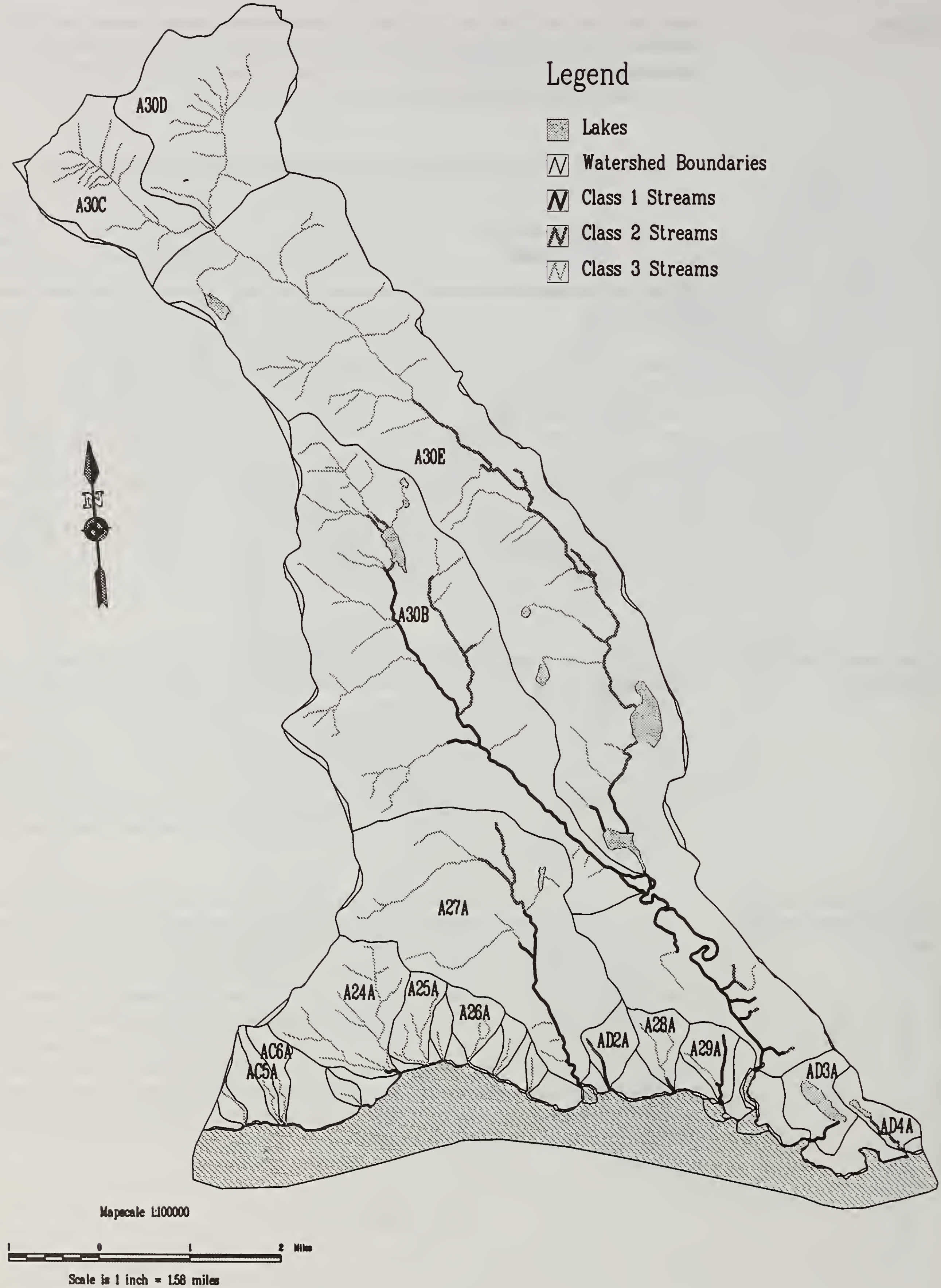
Tom Creek is the largest watershed.

Notable watersheds in the study area include Tom and Frank Creeks. Tom Creek, makes up about three-quarters of the study area and drains the entire northern portion of the VCU. Two lakes, Tom Lake and Campbell Lake are drained by Tom Creek. Frank Creek drains a watershed 6 times smaller than the Tom Creek drainage, but is the only other gradual sloping stream channel. Another 1,005 acre watershed (A24A) contains two steep, V-notch channels which meet on an alluvial fan just above saltwater. The fan itself is in stable condition, with advanced soil development processes occurring. All other study area watersheds are less than about 300 acres in size (See Figure 3-4).

Drainage densities are high, especially on the West Face.

Drainage densities in Table 3-2 are determined from the Stikine Area channel type inventory and corresponding GIS database. Drainage density is a measure of the total inventoried stream length in a basin divided by the basin area. Higher drainage densities indicate a watershed is more "dissected" than another, and therefore the risk that erosion processes will deliver sediment to a stream channel is greater. On the Stikine Area, drainage densities range from less than one to greater than 10 miles per sq. mile, with a median value of 2.8. The Campbell watersheds have a median drainage density of 3.50 indicating that the Campbell study area is more dissected than the median Stikine Area watershed. The small, steep watersheds along the Bradfield Canal have higher drainage densities and are responsible for this high value.

FIG. 3-4, WATERSHED BOUNDARIES AND STREAMS



Peak flows occur twice a year in the spring and fall.

These drainages receive a range of annual precipitation from 100 to 120 inches. Approximately 63 percent falls between September and February. Runoff processes in the Tom Creek watershed produce average annual discharges on the order of 11.5 cubic feet per second (cfs) per square mile. Two-year peak flows of 111 cfs per square mile may occur, usually associated with intense October storms, or early spring rain-on-snow events. Summer low flows of 0.36 cfs per square mile are possible, but are not considered potential impediments to fish passage and spawning success. Stream temperatures likely remain within anadromous fish limits year-round.

The Building Blocks: Fish, Vegetation and Wildlife

The living parts of the ecosystem respond to the non-living processes and result in the plant and animal communities we see. Fish depend on factors which are dictated by geology, soil and water processes such as; access, composition of the stream bottom, nutrients, vegetation and structure. Important aspects of the plant communities include species composition, age, and structure. Southeast Alaska is dominated by a temperate rainforest composed primarily of Sitka spruce and western hemlock. On a local scale plant associations are affected by soil type, drainage, topography, and disturbance. Between glacial events the forest developed into an old growth state where small scale windthrow is the most common disturbance. These small disturbances create important horizontal and vertical layers of vegetation (structural diversity) in old growth forests. These include small scale patches of various ages and sizes of trees, variable tree density within the forest stand, and a multi-storied canopy. This structure allows enough light to reach the forest floor so that understory production is high, while intercepting sufficient snow to make that food available to herbivores (eg., deer, goats) in winter.

Fish

Waterbodies of the study area that have the most habitat and produce most of the fish are Tom and Frank Creeks. There are six other unnamed streams which have small populations of fish. Because these streams vary in both the amount and quality of the habitat, they produce varying numbers and species of fish (See Table 3-3). These streams are shown in Figure 3-18, later in this Chapter.

Tom Creek spawning habitat is best just above and below the lake.

Tom Creek and Lake- Tom Creek is the largest stream in the study area. It has the most fish species, produces the most fish, and has the most sportfishing use. Tom Creek is a fourth-order Class I stream containing good to excellent habitat over most of its length. Habitat is utilized by all five species of salmon and steelhead. The lower two miles of the stream flow through deep deposits of silt and sand. Erosion of these deposits has resulted in tightly compacted streambed gravels. Fish have been observed digging redds in this heavily embedded reach, but egg-to-fry survival is not believed to be good. Although limited, excellent spawning areas exist in the floodplain reaches immediately above and below Tom Lake. These accessible gravels are loosely compacted and generally two to six inches in size. These spawning areas may seed the rest of the accessible system.

Table 3-3, ADF&G Numbered Fish Streams

Stream Number	Stream Name	Major Species & Escapement Average/Peak	Other Species	Habitat Quality	Special Considerations
107-40-10470	Tom Lake Creek	Pink 10,500/52,600 Chum 1,300/9,600 Coho (No record) Sockeye 50/500 Chinook 10/100	Steelhead Cutthroat Dolly Varden	excell. spawning good rearing	spawning habitat limited embedded gravels lower ⅔ 2 lakes in system sideslopes of silt/sand in lower ⅔ long intertidal zone low gradient
107-40-10400	Frank's Creek	Pink 4,000/26,00 Chum 130/2,000 Coho (No record)	Steelhead Cutthroat Dolly Varden	very good spawning good rearing	banks of clay, silt, & sand along lower reach
107-40-10390	unnamed	Coho (No record)	Pink	Poor spawning poor rearing	short reach; large substrate
BC-9	unnamed	Coho (No record)	Cutthroat Dolly Varden Pink	fair spawning fair rearing	banks and bottom of clay silt, sand thru-out length
107-40-10450	unnamed	Coho (No record) Pink 800/1,500 Chum 4/20	Dolly Varden	poor spawning poor rearing	short, steep gradient large substrate
BC-10	unnamed	Chum (No record)	Coho Dolly Varden	poor spawning fair rearing	embedded gravels sideslopes of sand/silt
BC-11	unnamed	Coho (No record)	Pink Cutthroat	good spawning fair rearing	large substrate silt/sand banks in lower reach
BC-12	unnamed		Cutthroat	poor spawning good rearing	large substrate short reach

Tom Creek rearing habitat is good.

Rearing habitat is fair to good from Tom Lake downstream. Abundant aquatic vegetation provides good cover for juvenile salmonids. The number of instream logs is low, probably due to channel width associated with fourth-order streams or to the regulating effect of Campbell and Tom Lakes. Most of the large wood in the lower 2/3 of the stream is concentrated in one log jam located at a bedrock constriction near tidewater. This single concentration of large wood may be due to the power of ice flows occurring with rain-on-snow events. The slack waters of Tom Lake absorb sunlight, creating water temperatures that are close to optimal for salmonid growth. Potential coho rearing capacity of the lake was enhanced in the mid-1980's by felling trees in the lake at selected points along its shore.

Tom Lake is fed almost entirely by Campbell Creek, a third-order stream. Nutrients exported from Campbell Lake enhance the productivity of the lower Tom system. Upstream migration above Tom Lake is stopped by a 75-foot barrier falls below Campbell Lake. Access to upper Tom Creek is blocked by a series of 6-to-15-foot falls.

Frank Creek spawning and rearing habitat is good.

Frank Creek- Frank Creek is a third-order Class I stream containing good fish habitat, supporting steelhead and all North American salmon species except chinook. Spawning habitat is well distributed throughout its length. Spawning gravels are moderately compacted and generally one to six inches in size. Rearing habitat ranges from fair to very good over the stream length. Beaver activity enhances rearing capacity via nutrient cycling and the creation of cover. Channel stability ranges from fair to good over most of its length. The lowermost mile is bordered by hillslopes comprised of fine-textured deposits. Deposits of blue clay are exposed near tidewater. Riparian vegetation is the major factor contributing to channel stability and habitat formation, especially in the upper Class I reach.

Other streams in the area have limited fish habitat.

107-40-10390. This unnamed, second-order stream is located west of Frank Creek, near the westerly edge of the study area, adjacent to an abandoned prospector's campsite. Over time, the bedload of two high gradient tributaries has formed an alluvial fan of coarse sediments through which this stream cuts. Small populations of coho and pink salmon, cutthroat trout, and Dolly Varden char use the limited habitat.

BC-9. Located just east of Frank Creek, this unnamed Class I stream drains steep forested slopes to the east and a narrow band of muskeg to the west. This second-order stream is less than ten feet wide throughout its length. Limited habitat quantity and fair habitat quality combine to create a low fish production potential. Fine-textured deposits contribute to low productivity and present a risk to water quality.

107-40-10450. Located between creeks BC-9 and BC-10, this unnamed second-order stream drains a small bowl-shaped watershed known locally as "hollywood bowl." The lower 1000 feet is Class I but production potential is low due to steep gradient and large substrate. Fine-textured deposits present a risk to water quality, but this risk is reduced by steep gradient.

BC-10. Located just west of Tom Creek, this unnamed second-order Class I stream drains rocky, forested slopes to the west, and extensive muskeg over deep, fine-textured deposits to the east. Gravels are heavily embedded with sand and silt eroded from surrounding slopes. Production potential is very low due to the small size of the stream and the natural fine sediment load.

BC-11. Located just east of Tom Creek, this second-order Class I stream drains a small lake. Along a short section near saltwater, streambanks are comprised of fine-textured deposits. Nearer the lake, the stream drains muskeg. Coho are known to inhabit the stream, but it is only assumed that the lake habitat is used for rearing. The outlet stream provides the only known available spawning area. Production potential is low due to the small size of the stream and the limited amount and variety of littoral vegetation along the lake shore.

BC-12. This first-order Class II stream is located just east of BC-11. It drains mostly muskeg, possesses large substrate, and has an extremely low production potential.

There are no T&E fish species inhabiting the area.

Threatened and Endangered Species- There are no fish species inhabiting the study area which are listed, or proposed for listing, as threatened, endangered, or sensitive by the National Marine Fisheries Service pursuant to the Endangered Species Act. However, the Alaska Department of Fish and Game, Sport Fish Division has identified low returns of steelhead trout in streams adjacent the study area in the Bradfield Canal (Anan and Marten Creeks, Harding and Eagle Rivers) and has implemented a catch-and-release/unbaited, artificial lure with barbless hooks emergency regulation as a protection strategy. ADFG-Sport Fish Division has also identified reduced populations of cutthroat trout in streams Southeast region-wide and is currently considering a catch-and-release/unbaited, artificial lure with barbless hooks management strategy for this species.

Vegetation

The vegetation in the Campbell study area, like much of southeastern Alaska is a result of the cool climate and large amount of precipitation. Forested plant communities have overstory trees dominated by western hemlock and Sitka spruce, with lesser amounts of mountain hemlock, Alaska yellow-cedar and western redcedar. Shore pine, and red alder are also present in some habitats. The shrub species include blueberry, rusty menziesia, salmonberry, red huckleberry, alder, and devil's club. Forbs include five-leaf bramble, bunchberry, rosey and clasping twisted-stalk, fern-leaf goldthread, bluebeard, heart-leaf twayblade, trifoliate foamflower, and skunk cabbage. Also found are a variety of mosses, lichens, liverworts, and ferns, and a few sedges and grasses. Non-forest communities in the study area occupy muskegs, alpine meadows, estuaries, and riparian and snow avalanche brush communites. Table 3-4 shows the percentages of the major plant communities or associations in the study area. Figure 3-5 shows the location of these associations within the study area.

All plant communities in the study area, with the exception of several scattered even-age stands generated by past blowdown events, are presently in a climax stage, and represent the potential natural vegetation for the site. Other forms of disturbance affecting the vegetation in the area are snow, insects, diseases, ice, flooding, landslides and snow slides.

Table 3-4, Percentage of Plant Associations in the Study Area

Plant Community	% of Study Area
Western Hemlock Plant Associations	25%
Western Hemlock-Alaska yellow cedar Plant Associations	4%
Sitka Spruce Plant Associations	2%
Mixed-Conifer Plant Associations	2%
Mountain Hemlock Plant Associations	8%
Alpine Communities	26%
Alpine/Lichen/Rock	8%
Alpine Meadow	<1%
Alpine Complex	5%
Alder/Shrub Snow Avalanche slopes	8%
Riparian Brush Communities	1%
Muskeg emergent peat/sphagnum	9%
Muskeg tall sedge	<1%
Non vegetated	<1%
Estuarine (Intertidal Sedge/Forb Communities)	<1%

Hemlock trees and blueberry shrubs dominate the study area.

Western Hemlock Associations- In this association western hemlock is the dominant overstory species. Sitka spruce is an important component but rarely is as abundant as western hemlock. Mountain hemlock, Alaska yellow-cedar, shore pine and western redcedar are not present or represent only a very minor component. Western hemlock is also a major understory tree species. Productivity ranges from moderate to high and natural regeneration (young trees) is prolific. Most stands are multi-storied and have a high ability to intercept snow. The shrubs are usually dominated by blueberry and rusty menziesia. The presence of devil's club indicates some type of soil disturbance on some sites. Common forbs found in these plant associations include five-leafe bramble, bunchberry, rosey twisted-stalk, and fern-leaf gold thread. Presence of skunk cabbage in some communities indicates wet soil conditions.

The western hemlock associations are numerous in Frank Creek and form a large contiguous area. In Tom Creek the majority of the hemlock associations are on the west side of the watershed and at the head waters of Tom Creek. There is generally more Sitka spruce in the forests of Frank Creek than in Tom Creek.

There is not much cedar in the study area.

Western Hemlock-Alaska Cedar Associations- Both Alaska cedar and western hemlock are in the overstory of this association. Usually western hemlock is more abundant but Alaska cedar is always present. Western hemlock generally dominates the understory trees. This plant association is most common at higher elevations, just below the sub alpine zone. There are tall blueberry shrubs with lesser amounts of rusty menziesia and red huckleberry. Common forbs include bunchberry, fern-leaf goldthread, and five-leaf bramble. Other forbs that may occur include rosey and clasping twisted-stalk, foamflower, and heart-leaf twayblade. The presence of abundant skunk cabbage on some sites indicates wet soil conditions. These associations are moderately productive. Natural regeneration is primarily western hemlock with some Sitka spruce. Alaska cedar regeneration is uncommon. A multi-storied canopy provides moderate snow interception. Production of blueberry forage and persistent forbs is moderate. Snags are common in this plant association and tend to persist for many years due to the rot resistant properties of Alaska cedar.

Spruce stands are found along streams and on floodplains.

Sitka Spruce Associations- Sitka spruce plant associations are highly productive and usually found on sites with re-occurring soil disturbance. Sitka spruce is the dominant tree species and western hemlock can be co-dominant. Sitka spruce stands are primarily found on flood plains and alluvial fans where soils are periodically disturbed by flooding. If Sitka spruce is the climax plant community then the disturbance is naturally occurring and usually frequent for Sitka spruce to dominate the site. On sites with a less frequent disturbance, western hemlock will eventually replace the less shade tolerant spruce. Understory trees are dominated by western hemlock with lesser amounts of Sitka spruce. Shrubs include blueberry, rusty menziesia, but devils's club and salmonberry dominate in some associations. Skunk cabbage indicates wet soils on some sites. Other forbs include bunchberry, rosey and clasping twisted-stalk, fern-leave goldthread, five-leaf bramble, and trifoliate foamflower. Multi-storied stands have a high snow interception capability. Blueberry is usually present at low levels and forb production is moderate to high. Natural regeneration is mainly hemlock and Sitka spruce.

In the Campbell Study area the Sitka spruce communities are concentrated along streams and are the result of frequent flooding. Tom Creek drainage has a larger percentage of the spruce plant associations than Franks Creek.

The Mixed Conifer Series is common in Tom Creek.

Mixed Conifer Associations- These areas are generally composed of scrub forests. These plant associations are found on sites that are poor and have a mix of conifer species, including western hemlock, mountain hemlock, Alaska cedar, western redcedar, Sitka spruce, and in some cases shorepine. No conifer species is dominant. These associations usually occur on wet, poorly drained sites but can occur on shallow well drained soils. Rusty menziesia and blueberry make up a tall dense shrub layer. Forbs present include bunchberry, five-leaf bramble and fern-leaf goldthread. Skunk cabbage, rosey twisted-stalk, heart-leaf twayblade, deer cabbage, twinflower and bluebead may also be present. Some plant associations in this series are not considered capable of producing commercial wood products. Natural regeneration of spruce and hemlock is common on these associations. Growth is slow. This association can be important to wildlife because blueberry forage and the production of persistent forbs is high. Snow interception is low making forage unavailable to wildlife during the winter.

Within the study area, the mixed conifer plant association is usually found on very wet sites around muskegs. Mixed conifer and muskeg communities are very common in the Tom Creek drainage.

There are some unique plant communities in the area.

Other Plant Communities- Although there are no Threatened and endangered plant species known to exist in the Campbell study area there are some plant communities which are unusual or limited. The plant species *Calamagrostis crassiglumi* (a wet, marshy area grass) and *Carex lenticularis* var. *dolia* (an alpine species) are plant species being considered for protection under the Endangered Species Act which may be present in the study area according to the Fish and Wildlife Service.

Western redcedar is limited to the immediate beach fringe area below elevations of 200 feet. Redcedar is not found farther up the Frank or Tom Creek valleys. This is thought to be one of the northernmost extents of this species on the mainland. Estuarine sedge/forb communities are very limited in the Campbell study area. These communities although small, are quite important to wildlife. A riparian freshwater meadow, of approximately 130 acres, is a prominent vegetative feature on Tom Creek just downstream from Tom Lake. Freshwater meadows are not common anywhere on the Forest and this is the only community of this type on the study area.

A rather unusual community dominated by dense thickets of Oregon crab apple (Malus diversifolia) are found in the Tom Creek watershed. These are small communities of only 2 or 3 acres in size on steep rocky slopes. Although this species is frequently found in small numbers scattered along the edge of meadows and muskegs, it is very unusual to find it in dense stands on steep upland sites.

FIG. 3-5, MAJOR PLANT ASSOCIATIONS

Forest Plant Communities and Succession- Plant communities are the result of numerous factors related to climate or soils. Probably the most important factors are temperature extremes, amount and timing of rain and snow, wind, and the depth and drainage conditions of the soils. Other factors influencing plant distribution include aspect, elevation and slope which influence the microclimate and soils factors. Some plant species have very specific requirements while others can grow within a wide range of conditions and are less useful as "indicators" of specific environments. Plant communities are also influenced by competition. The plants that are best able to compete given the site conditions will be the ones to outcompete others for light, water and available nutrients. Conditions are also changing. Generally the smaller the patch size of the plant community the more changes that can occur. Under a dense forest canopy species that can grow in the shade will be favored. As a result of a disturbance such as windthrow additional light will reach the forest floor and trigger the growth of plants.

It takes about 300 years for an old growth forest to develop.

Following a disturbance such as logging, plant species respond depending on the type, amount and timing of the disturbance. Usually forbs, shrubs, and new conifer seedlings become established quickly. The increased sun light reaching the ground warms the soil and helps make more nutrients available to the growing plants. As the plants grow, competition increases for the available light and nutrients. In 15 to 30 years the lower branches of the trees begin to touch and the number of forbs and shrubs decrease because of shading. Competition between the trees also occurs. The more vigorous trees will continue to grow and increase the shading of overtopped trees. The overtopped trees will begin to slow their growth or die. As the trees get older more trees die off and some openings in the canopy can occur, letting light reach the forest floor. This light will re-stimulate shrubs, forbs, and seedling germination and growth. Usually an understory of forbs and shrubs will begin to develop about 100-150 years after the stand originated. The trees continue to compete with each other. Insects, and diseases also become a factor and additional openings will occur. As more light reaches the floor a second or third story of young tress will begin to develop. After about 200 years the trees will be of different heights and sizes. There should be a forb and shrub understory with most or all of the species that were present before the disturbance. By age 300 years, the stand can resemble the original old growth condition on most sites.

Disturbance plays an important role in the forest.

Natural causes of disturbance are disease, animals, insects, wind, root rots, and sometimes landslides and avalanches. These factors can perpetuate and play a role in developing old growth conditions or in regenerating areas but their levels can be influenced by the environment and management. Dwarf mistletoe is present on the site and affects mainly hemlock. Insect populations are normally kept in check by the cool moist climate but outbreaks of several species have occurred in southeast Alaska in the last 100 years. Animals often feed on the tops of seedling and porcupines will eat the inner bark, especially near the top of the trees. Yellow cedar is presently declining in southeast Alaska. The cause is unknown but is thought to be related to climatic changes and perhaps changes in soil conditions. Large windthrow or avalanche areas do not exist in the study area. Windthrow is a small scale event and can often take place in stands of trees already made susceptible by root rots that weaken the roots and lower boles of trees. Long linear avalanche slides are common on the west face of the study area and are dominated by brush species.

Wildlife and Biodiversity

The plant associations vary in their value to different wildlife species. Some wildlife species have specialized habitat requirements (eg., goats) while others are habitat generalists and utilize the variety of plant communities available (eg., bears). Size and inter-connectedness of habitat patches in relation to the size and mobility of particular wildlife species affect the suitability of a given area to a particular species.

Biodiversity concerns keeping the variety of life and its processes.

Biological diversity- The concept of biological diversity (biodiversity) relates to the maintenance of ecological processes and plant and animal species so that their population numbers can fluctuate but maintain viability through time. The National Forest Management Act directs the Forest Service to provide for diversity of plant and animal communities. Specifically, wildlife habitat is to be managed to maintain viable populations of existing native and desired non-native species. The Tongass Land Management Plan Revision Supplement to the Draft Environmental Impact Statement (TLMP SDEIS) contains a discussion of biodiversity as it relates to southeast Alaska and the Tongass National Forest. At the project level several components of biodiversity can be analyzed, such as species diversity, threatened, endangered and sensitive (TES) species, patch size and shape, fragmentation of habitats, and habitat linkages (corridors) (Williams and Marcot 1991).

Eight species are used as "indicators" of the habitat for other wildlife.

Species diversity refers to the number of species present and to the numbers of individuals of each species that are present. This depends on the number of different habitats present and the characteristics of the species (ie., geographical range, home range size, dispersal and population characteristics). Because it is not possible to analyze all of the species that occur on the forest, the Forest Service developed the **Management Indicator Species (MIS)** concept to help evaluate the potential effects of resource management on wildlife. MIS are species whose population changes are believed to indicate the effects of land management activities (USDA Forest Service 1982). MIS are selected to be representative of certain habitat requirements and groups of species, with the intent that by monitoring the MIS the Forest Service will also gain information on other species and the vegetation communities (habitat) for which it is representative. The Forest Service, in cooperation with the Alaska Department of Fish and Game, US Fish and Wildlife Service, and National Marine Fisheries Service analyzed 394 species of mammals, birds, amphibians and reptiles. Of these, 22 species of birds and mammals met the criteria for Management Indicator Species for the Tongass National Forest (Sidle and Suring 1986). From these 22 species, 8 species which best represented the habitat and management issues were chosen to evaluate the potential impacts of the Campbell Timber Sale.

Table 3-5 shows the selection rationale, habitat needs, and the important ecological zones for each of the eight species selected. A literature review of the habitat requirements of these species is included in Appendix B of the TLMP SDEIS.

Table 3-5. Wildlife Management Indicator Species for the Study Area

Species	Selection Rationale/ Habitat Feature/ Primary Zones
bald eagle	High profile species with special habitat needs; forest canopy structure that allows access to large open crowned trees along lakes, streams and ocean shores; Saltwater Influence Zone and Freshwater Influence Zone are important ecological zones.
brown bear	Sensitive to human interaction and identified as a key issue in public scoping; mixture of vegetation types for forage, cover and denning; Saltwater Influence Zone and Freshwater Influence Zone are important ecological zones.
hairy woodpecker	Primary cavity excavator; mature uneven age stands with many snags; Saltwater Influence Zone and uplands are important zones.
mountain goat	High profile species and identified as a key issue in public scoping. Also has special habitat needs; cliffs in old growth forest and near alpine; the Upland Zones and the Alpine/Brush Zone are of importance.
marten	Important furbearer representing upland old growth forest; forests with large snags and downed logs for dens and prey habitat, sensitive to human access; Saltwater Influence Zone and the Upland Zones are important.
river otter	Coastal riparian habitats; > 50% canopy cover, large trees for den sites, steep rocky beaches; Freshwater and Saltwater Influence Zones are key.
Sitka black-tailed deer	Present but not abundant in study area but are an important game and subsistence species and an indicator for: low elevation, multi-canopied forest with forbs and blueberry in understory; Saltwater Influence Zone and Saltwater-Facing Uplands
Vancouver Canada goose	Waterfowl representing freshwater riparian habitats; riparian old growth forest with blueberry and skunk cabbage understory, estuary sedge flats; Saltwater and Freshwater Influence Zones are important.

No "T,E and S" species are known to inhabit the study area.

Threatened, Endangered, and Sensitive Species are those species for which there is concern about their continued viability. Endangered and threatened species are covered under the Endangered Species Act (ESA). **Endangered species** are those that are "threatened with extinction throughout all or a significant portion of their range" (ESA, PL 97-304). Endangered species potentially occuring in the project area include the American peregrine falcon (*Falco peregrinus anatum*) and humpback whale (*Megaptera novaeangliae*). Neither of these species reside or breed in the study area but may migrate through. **Threatened species** are "species which are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (ESA). Threatened species that may occur in or near the study area are the arctic peregrine falcon (*Falco peregrinus tundris*) and the Stellar sea lion (*Eumetopias jubatus*). These species also do not breed in the area but may migrate through or be occasional visitors.

There are six Category 2 species which may inhabit the study area.

Category 2 species are also under the purview of the ESA. Category 2 species are species which US Fish and Wildlife Service is considering listing as endangered or threatened. Category 2 species potentially occurring on the study area include **marbled murrelets** (*Brachyramphus marmoratus*), **northern goshawk** (*Accipiter gentiles*), **harlequin duck** (*Histrionicus histrionicus*) and **spotted frog** (*Rana pretiosa*) plus the plant species *Calamagrostis crassiglumi* and *Carex lenticularis* var. *dolia*.

There is one Sensitive species which does use the area.

Sensitive species are those plant and animal species identified by the US Forest Service whose population viability is a concern on National Forests within the region (TLMP SDEIS). These species are the **trumpeter swan** (*Cygnus buccinator*), **Peale's peregrine falcon** (*Falco peregrinus pealei*) and **osprey** (*Pandion haliaetus*). Two to four swans, presumably migrating trumpeter swans, were seen using Tom Creek in the fall by Forest Service and Fish and Wildlife Service personnel. They are also known to winter on the Bradfield River nearby when the river is not iced over (winter survey data, Wrangell Ranger District). However, swans are not known to nest on the study area. Osprey have not been observed on the study area. Peale's peregrine falcons nest in southeast Alaska but there are no known nests in the study area.

Old Growth patch size is important to biological diversity.

Patch size and shape. In the context of biodiversity, patches can be thought of as islands of habitat. The important concepts about patch size and shape are maintenance of forest "interior" and large contiguous habitat blocks. Edges between forest and nonforest environments are essentially a habitat type in and of themselves and often have a different environment and species than the forest interior.

There are large old growth habitat blocks in and around the study area.

Forested stands of Volume Class 4 and greater were used to define forested old growth areas. The majority of the forest in the study area is presently in one large block that is contiguous with the adjacent watersheds of Martin Creek and the Harding River. The amount and size of interior forest blocks was determined by using the computer to "remove" the forest edge for 300 feet (or approximately 3 tree lengths) from the edge of forested old growth areas. Figure 3-6 and Table 3-6 show that the West Face of the study area provides a connection between the large blocks of contiguous old growth in the Martin Creek and Harding River watersheds. These two watersheds are not scheduled for timber harvest under the Tongass Land Management Plan.

FIG. 3-6, OLD GROWTH BLOCKS IN WAA

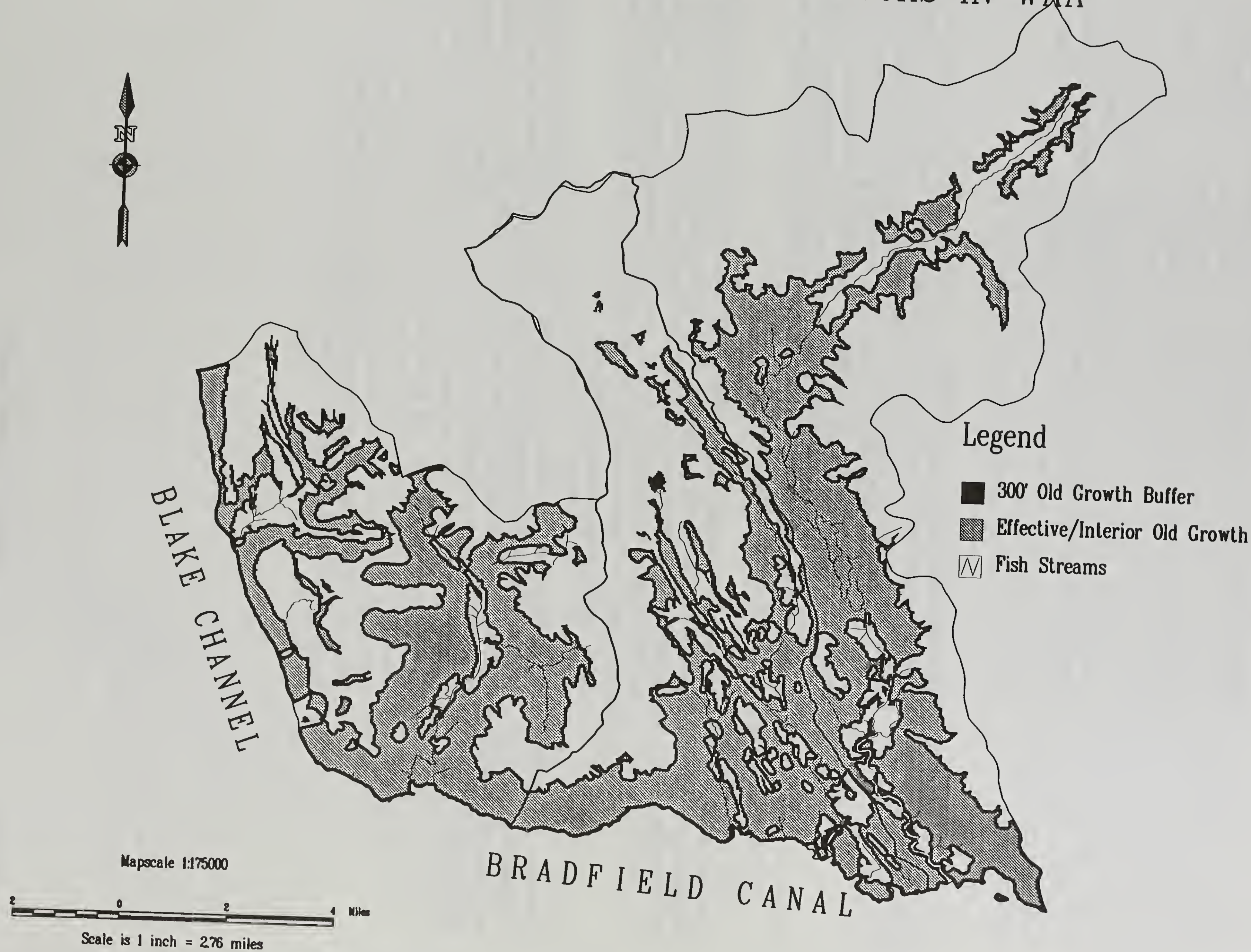


Table 3-6, Old Growth Blocks Within the WAA

Without buffer	#Blocks	#Acres	Miles of perimeter
Greater than 1000 acres in size	1	39,856	343.88 miles
Less than 1000 acres in size	26	2,494	58.78 miles

Interior forest w/buffer	#Blocks	#Acres	Miles of perimeter
Greater than 1000 acres in size	2	24,556	200.90 miles
Less than 1000 acres in size	73	4,404	113.64 miles

Fragmentation of old growth blocks can occur with timber harvest.

Fragmentation results as large continuous blocks of habitat are replaced by different vegetation structures or species. Over time the habitat changes from a contiguous block to a matrix of new vegetation with small patches of the old habitat, thus leaving "fragments" of the original habitat. In southeast Alaska this generally means replacing old growth forests with managed forests which preclude achieving the characteristics of old growth forests. Concerns associated with habitat fragmentation include the replacement of suitable habitat with unsuitable habitat, creation of edges, and the creation of barriers to migration and immigration.

Tom Creek habitats are naturally fragmented with Muskegs

There has been no previous harvest in the study area so all current forest fragmentation is a result of natural processes (i.e., patches of muskeg in the forest matrix). Natural fragmentation is most concentrated in the Tom Creek area where abundant, wet muskegs overlie the sand deposits in the valley. Barriers created by fragmentation are specific to a certain species. Barriers may include patches of unsuitable habitat, roads, streams, mountains, and ocean.

There is an important habitat corridor between the Tom Creek and the Harding River.

Habitat linkages (corridors) operate on 2 scales. On a landscape scale they provide for movement of animals between local populations. This allows for genetic exchange and enhances the viability of local populations. It also allows for recolonization of an area where the local population has become extinct. Corridors also provide for seasonal and daily movements. For example they may provide for deer to migrate between low elevation winter range and alpine summer range, or for bears to travel between fish streams and bedding areas. Presently the study area and the surrounding watersheds are in their natural state and travel on a local and landscape level is not restricted. A particularly important travel corridor between the Martin Creek and Harding River drainages is located on the eastern boundary of VCU 510.

The People: Past and Present Values

Although the resources of the area are varied and abundant, the steep and broken terrain of the Bradfield landscape presents a challenge to human access. The study area is typical of the surrounding area with those few areas which have access serving the needs of both present and historic people. Important sites and areas of long-ago residents are the same sites of importance today. These areas represent a continuum of important "human habitats" in the study area because like wildlife, different groups of people have different needs and values for the landscape. In the Campbell landscape these habitats overlap in a consistent pattern. Although some of the social values have changed over time, the areas of importance have remained the same. Figure 3-7 shows and Table 3-7 summarize the "human habitats" of the project area which are discussed in more detail below.

Table 3-7, Human Habitat Descriptions

Division	Area	Potential Change in Setting	Description
A	West Face	High, Visual	Seen from the Anan travel route and Bradfield Canal; seen more than visited due to steep slopes; lower portions are suitable and accessible for timber production; provides key south-facing habitats for goat winter range.
B	West Face	High, Visual	Same as A except only seen from Bradfield Canal.
C	Frank Creek	High, Visual & Access	Estuary accessible to historic and present day people; important area for fishing and opportunistic hunting; Crabbing outside the mouth of the creek; no harvest of timber but contains possible LTF site.
D	Frank Creek	Very High, Visual & Access	Semi-primitive; enclosed interior setting; partially viewed at an angle from the Bradfield Canal; includes a "bowl" which faces directly on the Canal; foot access difficult; potential for roads; limited hunting or fishing are only attraction; greatest potential for timber production while minimizing conflicts with other uses and values.

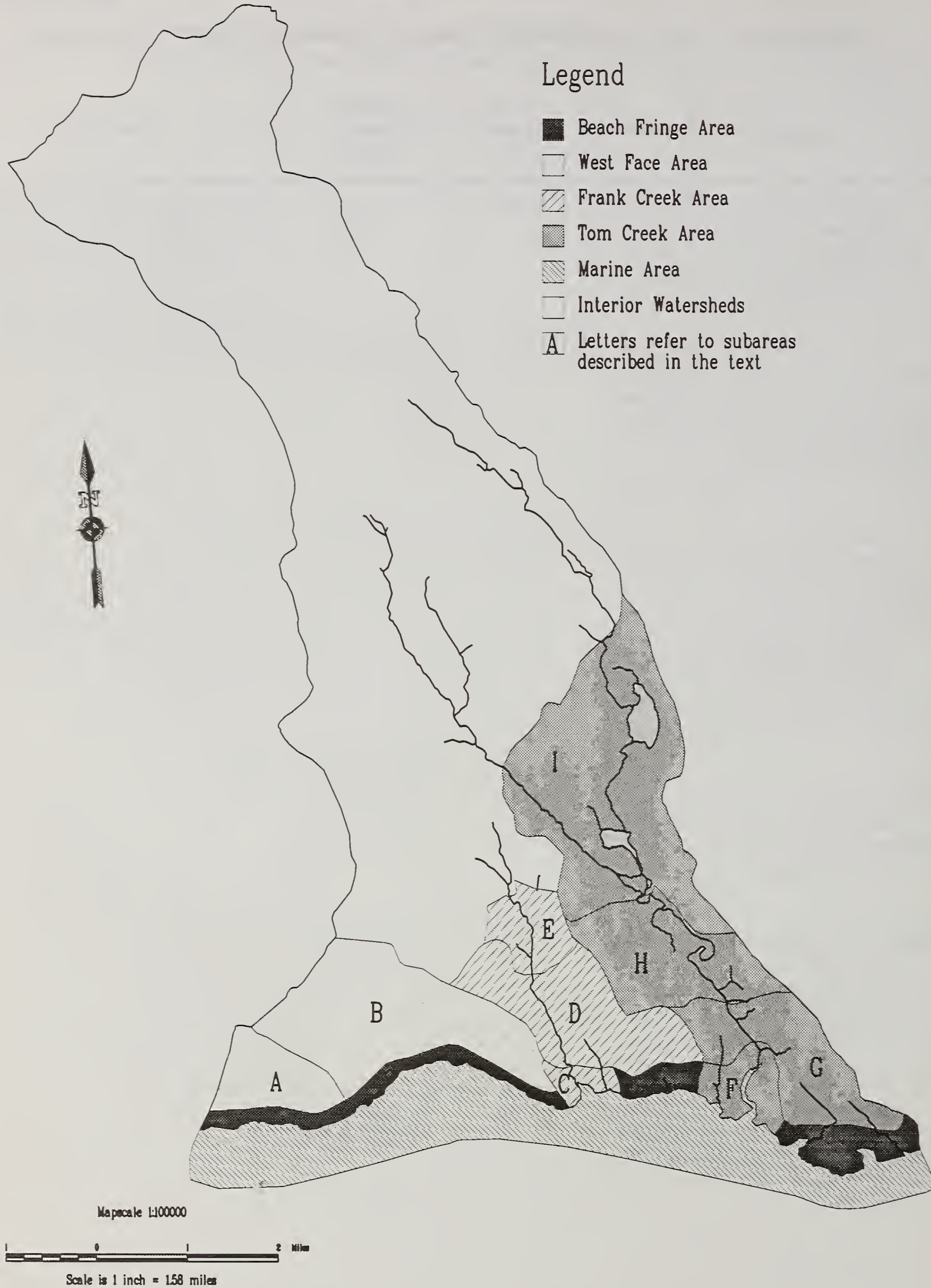
Table 3-7, Human Habitat Descriptions (continued)

Division	Area	Potential Change in Setting	Description
E	Frank Creek	Moderate	Very difficult access due to the need for traveler to cross creeks; unseen to the boater or hiker; just within the range of helicopter access for timber production.
F	Tom Creek	Low	Most important estuary in VCU historically and present day; fishing, crabbing, hunting and viewing wildlife; boat and foot access easy; important to guides; no potential LTF sites or timber production; high wildlife values.
G	Tom Creek	High, Access & Visual	Semi-primitive, non-motorized; access is relatively easy across muskegs on foot; jet boat needed on creek; access to Harding River; some area seen from Harding watershed; potential for roads; limited value for timber production; high scenic values; high wildlife values; bears; important to guides.
H	Tom Creek	High, Access & Visual	Same as G except more primitive and no access or views of Harding River watershed; potential road access for timber harvest terminates in this division; access by foot is more difficult.
I	Tom Creek	Low	Only division having high recreation and scenic values which is not accessible to timber production; 2 lakes; fishing and hunting; high quality scenery; very difficult access; primitive.
Wild	Interior Watersheds	Low	Extremely difficult access; very primitive, wild area; steep terrain; glaciers in the far north of the VCU.

Table 3-7, Human Habitat Descriptions (continued)

Division	Area	Potential Change in Setting	Description
(none)	Beach	Low	Historically important; accessible; high wildlife values; semi-primitive; motorized; opportunistic hunting and fishing off-shore; far east bay has potential LTF site; scenic foreground; no potential timber harvest except free use or salvage.

FIG. 3-7, "HUMAN HABITATS"



Past People and Cultural Resources

The Cultural Resource Overview of the Tongass National Forest (Arndt et al. 1987) describes the diversity of cultural heritage sites that have the potential of being discovered in southeast Alaska. The reader is directed to that report for a more detailed description of the cultural heritage of southeast Alaska. The following description is a summary of information we gathered during an extensive literature and files search.

Tlingit clans used the area for hunting, fishing and possible summer camps.

Background research has revealed limited information about past cultural use of Bradfield Canal and even less about the study area. The Nanyaayih clan of the Stikine Tlingit traditionally claimed and utilized the Bradfield Canal area. Apparently other clans also claimed portions of the Bradfield Canal. The Katchadi and Kiksadi people occupied a village site on the southern coast of the Bradfield Canal. Each clan owned tangible property, such as salmon streams, berry patches, offshore waters for hunting sea mammals and bottom fish, and both winter and summer homes; as well as intangible property including crests, house and personal names, songs and origin myths. Ethnographic data suggests indigenous peoples utilized the Bradfield Canal primarily for hunting and fishing. Chief Shakes reportedly had a summer camp in the Bradfield Canal which eventually burned. One of Vancouver's survey parties, lead by Johnstone, made the first European discovery of Bradfield Canal on August 26, 1793. Vancouver's survey party met three Indians in a canoe at the mouth of Bradfield Canal, their first such encounter since entering Ernest Sound.

Historic sites include cabins, camps and evidence of beach logging.

Historic period sites (at least 50 years old) within the study area include cabins, camps and logging-related sites. Historic period activity has been primarily limited to natural resource development and extraction. Forest Service records indicate selective hand logging began along the coast around 1916. As early as 1921 power project site were authorized by the federal government both at Tyee Creek and the Harding River with power site classifications issued in 1927 at the Harding River and Tom Creek. There is no evidence, however, that any of these sites were ever developed. Native informants refer to at least several camps within Bradfield Canal used for trapping, hunting and fishing during the period predating 1940.

Several field surveys have been done in the study area.

The Forest Service and others have completed heritage resource surveys for various activities along the Bradfield Canal, including several within the study area. A review of Stikine Area files indicates four reconnaissance and complete surveys have been conducted within the study area prior to this study. A survey was conducted in 1980 of select locations for an alternate powerline route for the Tyee Lake Hydroelectric Project (Andrews 1980). Archaeologists performed a limited survey where the proposed route crossed Tom Creek, Frank Creek and an unnamed creek between Marten and Frank Creek. No heritage resources were recorded. Forest Service archaeologists surveyed about three miles of the study area's coastline for a timber sale planned in 1980. In 1984, three of the proposed timber harvest units were surveyed. In 1992, Stikine archaeologists performed field surveys for this project analysis.

No sites are presently listed in the National Register.

There are no sites in the study area which are listed in the National Register of Historic Places. A 1975 archaeological and historical survey of the region conducted by Sealaska Corporation identified no historic or cemetery sites within the study area. Site and survey information is on file at the Stikine Area Supervisor's Office. This information is generally not available to the public because of site sensitivity to looting and vandalism.

Probability models are used to predict the location of potential sites for survey.

The current forest-wide cultural resource probability model considers slope angle and elevation as the two primary environmental factors for establishing a high, medium or low probability for cultural resource discovery. The elevation and slope angle figures used to delimit the probability zones are general guidelines. The high probability zone is defined as all areas between mean high tide and 100 feet in elevation. The medium probability zone is defined as all areas between 100 and 1,000 feet in elevation, with slope angles of 30 percent or less. The low probability zone is defined as all areas between 100 and 1,000 feet with slope angles greater than 30 percent; all areas above 1,000 feet, regardless of slope angle; and muskeg areas.

We "fine-tuned" the models for this project analysis.

Examination of past survey records on the Tongass National Forest suggests the potential for cultural resources above 100 feet in elevation is extremely low throughout southeast Alaska. We conducted field surveys for this analysis that exceeded 300 feet in elevation, however no sites were discovered above an elevation of 50 feet. We revised the probability model for the current study based on a review of field surveys and known cultural resources. The high probability zone is defined as all areas between mean higher high tide and 100 feet in elevation. In addition to this the high probability zone includes a zone around all study area streams and lakes that have historically contained anadromous fish and areas of traditional ethnohistoric subsistence use. We compressed the former medium and low probability zones to create a low probability zone which consists of all areas above 100 feet in elevation, not included within the high probability zone.

Five more sites were added to q total of ten sites on the AK Heritage Resource Survey.

Stikine Area archaeologists surveyed approximately 780 acres between August and September, 1992. Archaeologists surveyed most of the coastal area, including intertidal areas, and as high as 300 feet in elevation to determine the number and nature of study area cultural resources. This survey resulted in the addition of five sites to the Alaska Heritage Resource Survey bringing the total number of recorded study area sites to 10. It appears that eight of the sites potentially meet the eligibility criteria for the National Register of Historic Places. Archaeologists recorded only 29 culturally modified trees during the survey, a low number compared to other areas on the Wrangell Ranger District.

Emphasis during the 1992 surveys was placed on survey within the marine zone, saltwater influence zone, freshwater influence zone and saltwater-facing uplands. These are zones where cultural resources are known to exist, either in the study area or in surrounding areas. Archaeologists commonly find fishing structures, rock alignments and petroglyphs in the marine zone at or near mean high tide. The saltwater influence zone typically has the highest density of cultural resources. People have traditionally utilized this zone for habitation, subsistence, recreation and related purposes. Subsistence sites, including culturally modified trees, may be located in the saltwater-facing uplands although much of this zone in the study area is steep and inhospitable.

Fishing

Human use of fish resources can be traced back to use of stocks from Tom Creek and nearby streams by Native populations prior to white settlement. Bradfield Canal-origin chinook were formerly targeted during local king salmon derbies due to their large size and abundance. The current depressed condition of Bradfield Canal-origin chinook stocks appears to have been the result of a complex combination of environmental conditions and the evolution of markets, gear, harvest areas, and land and fisheries management.

Sport fishing is growing.

Sport use of Bradfield-origin stocks has steadily increased, especially in the guided and charter sector, with steelhead and chinook being targeted. **Commercial fishing** of Bradfield-origin stocks takes place from Pt. Warde outward. Openings at Pt. Warde targeting escapement surpluses of Anan pinks also intercept Bradfield-bound chinook and other species. These openings have occurred infrequently in recent years due to greater interception of pinks closer to outside waters. Other commercial uses of the area include crabbing and shrimping.

Subsistence

The Alaska National Interest Lands Act (ANILCA, 16 USC 3113) provides the definition of and the authority to manage resources for subsistence uses. ANILCA defines subsistence uses as: "The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade."

Congress declared that "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands and by Alaska Natives on Native lands is essential to Native physical, economic, traditional, and cultural existence and to non-Native physical, economic, traditional, and social existence". It also stated, in part, under Section 804: "Except as otherwise provided in this act and other Federal laws, the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes."

Subsistence reinforces cultural and social values.

Subsistence is economically important to Alaskans because of the remoteness of the area and the seasonal nature of resource related occupations (logging, fishing, tourism). However, subsistence is more than hunting and fishing to make ends meet. It reinforces cultural and social values as well. Subsistence resources provide a foundation for Native culture, ranging from the totemic basis of clan divisions, to norms governing the distribution of wealth in potlatch ceremonies, to reinforcement of basic values of respect for the earth and its resources (Glass et. al, 1990, Muth and Glass 1989). Among non-Natives it contributes to self-reliance, independence and the ability to provide for oneself: values that are important reasons why many non-Native people emigrate to or remain in Southeast Alaska (Alves 1979).

Originally under ANILCA, the State of Alaska continued to manage the use of fish and wildlife as long as it enacted subsistence laws consistent with the Act. However, a series of lawsuits and court rulings revealed a conflict between the State Constitution and ANILCA with respect to rural preference for subsistence uses. Thus, on July 1, 1990, the Federal government assumed subsistence management of fish and wildlife on Federal public lands. The Federal Subsistence Board is the governing body charged with the responsibility for regulation and allocation of subsistence uses of fish and wildlife. For a more thorough discussion of the history of the subsistence issue see the TLMP SDEIS and the FEIS for Subsistence Management for Federal Public Lands in Alaska.

Tlingit clans claimed ownership of subsistence areas.

Historical Tlingit Clan Hunting Boundaries- The basis for property ownership among the Indians of Southeast Alaska was the local clan division (Oberg 1973). Clan property included salmon streams, hunting grounds, berry patches, sealing rocks, trapping areas, and other resource hunting and gathering locations. Clan membership established the relationship of an individual to clan property held in common. Territory adjacent to Native communities was portioned out among the resident families or households as hunting, fishing, and berrying grounds (Krieger 1927). These lands were generally passed down from generation to generation, and the privilege to hunt, fish, or to gather berries belonged only to those individuals having ownership rights under Native law. Permission from the clan exercising property ownership was necessary before members from other clans could use the land.

Goldschmidt and Haas (1946) performed extensive ethnographic field research in southeastern Alaska. Based on their work, it appears that virtually every bay and stream was utilized for the subsistence taking of natural resources. The authors identified land use patterns associated with southeast Alaska Native communities which existed in the mid-19th century. A comparison of their maps, those from the 1987 Tongass Resource Use Cooperative Study (TRUCS) maps, and ADF&G Subsistence Division maps, indicates that hunting and fishing patterns by Natives in southeast Alaska are still tied, to a limited extent, with historical traditions of land and resource use. On the other hand, non-Native harvesters use patterns tend to be more opportunistic and often widely dispersed throughout the region. For a more thorough discussion of traditional Southeast Alaska Native territory issues see the TLMP SDEIS.

Communities With Subsistence Uses Within The Study Area- Most of the rural communities of southeastern Alaska rely on renewable natural resources for at least a portion of their subsistence needs. The hunting and collecting of resources used for subsistence plays an important role in the lives of the region's rural residents. It reflects deeply held beliefs, values, and attitudes. Many of these subsistence gathering activities become social events for families and communities. These resource gathering activities include such things as hunting, fishing, digging for clams, catching shellfish, gathering firewood, and collecting food items from berries to herring eggs. It also means giving, receiving, and trading subsistence items. Some of the major resources used for subsistence are deer, salmon, moose, trout, halibut, crab, clams, berries, and waterfowl (Kruse and Muth, 1990).

In attempting to identify the communities that use the Campbell Timber Sale area, a wide range of information was consulted including the data and reports from the TRUCS mapping effort, the TLMP SDEIS, and recent ADF&G harvest information. Based on this information the following communities have used the project area for subsistence purposes: Wrangell, Craig, Meyers Chuck and Thorne Bay. All have been determined to be rural by the Federal Subsistence Board.

The Saltwater Influence and Marine Zones are most used for subsistence in the study area.

Subsistence Use Areas- The TRUCS information documented the number of households that had ever used an area for hunting, fishing or gathering. The entire saltwater influence zone has been identified as having been used by up to 10-49 households for subsistence deer hunting. Use decreases inland so that only 1-9 households have ever hunted deer in parts of the freshwater influence zone and saltwater-facing uplands. Up to 10-49 households have used the marine zone for harvesting marine mammals, marine invertebrates, crabs, salmon, halibut and some shrimp. Regulated subsistence use of fish resources in the Bradfield Canal has been limited to harvest of hooligan (eulachon). Fish traps near estuaries indicate the traditional importance of those areas for fish harvest. The estuaries also provide habitat for waterfowl which have been harvested by Wrangell residents (Cohen 1989).

Most of the subsistence effort in the project is expended by Wrangell residents.

Subsistence Use By Wrangell- The community of Wrangell is situated along the northern limits of Wrangell Island, some 30 air miles and 36 water miles northwest of the project area. The 1990 US Census reported a population of 2,479. Thirty eight percent of the population is Alaska Native. Per capita income for the community in 1987 was listed as $11,989 (Kruse and Frazier, 1988). Presently, the community's economy is dominated by wood processing, commercial fishing, education, community services, retail trade, and government.

Wrangell residents hunt for moose, deer, goat, black bear, and waterfowl. They also fish for salmon, halibut, shellfish, and other finfish. In 1987, 75% of Wrangell households harvested at least one type of resource and 83% of those shared their harvest with others, resulting in a total of 95% of all Wrangell households using wild foods (Cohen 1989). This amounted to 439 pounds of usable wild food per household of which 131 pounds of meat was harvested by hunting, 282 pounds by fishing and 26 pounds from gathering (clams, herring eggs, berries, seaweed, etc) (Cohen 1989). Only fish harvested with state subsistence (personal use) permits are considered subsistence take. Most fish are traditionally harvested under sport fishing regulations with rod and reel or taken for home use by fishers from their commercial catch.

Subsistence Use In Other Communities- The data indicate that the level of effort expended by the Craig, Meyers Chuck, and Thorne Bay in this area is so small as to be insignificant. Background information on these communities can be found in the TLMP SDEIS and Betts et al 1993.

Recreation and Scenery

The visual experience of many visitors to Southeast Alaska is tightly controlled by means of transport (boats, air) that keep the viewer at some distance from the resource. This is different from many North American landscapes in which the viewer directly interacts with a greater portion of the landscape. The limited area seen by the visitor accounts for most of their impression of Alaska.

In billing itself as the 'last frontier,' Alaska is playing its strongest card. Some visitors will anticipate that wilderness will be delivered to them and more often than not, it is. Timber harvest activity risks conflict between the image the visitor expects of Alaska (the last "Wilderness") and their experience.

As timber is harvested in other areas, the Bradfield will be more important.

Patterns of recreation use in Southeast Alaska have changed markedly over the last ten years, and some of the changes affect the Bradfield Canal. A visual report of ten years ago (Buschmann, 1982) cited Bradfield's viewers as "...recreationists travelling to and from the Harding River Cabin...and the Tyee Power project". Since that time the Bradfield Canal has begun to receive the spillover from the increasingly popular Anan Bay and an increase in use by outfitters and guides looking for scenic locations with attractions. In spite of a history of past use (a major electrical generating station and much logging up the Bradfield River, and the Tyee powerline corridor that follows the south shore of the inlet) no obvious visual impacts exist in the Bradfield Canal. A current of opinion among local outfitter/guides is that Bradfield Canal is the last 'untouched' waterway in the area. A look at the Tongass Land Management Plan reveals that the Bradfield will have relatively less visual evidence of harvest over time than other local viewsheds.

Guided visitor use is increasing in the Bradfield.

The Wrangell Ranger District received 21 applications for use of the Bradfield Canal area by outfitters and guides in 1993. This is an increase over a historic level of 9 permits between 1991-92. The type of guide services includes sightseeing, sportfishing and big game hunting (usually bear or goat). Group size varies from 1 to 23 clients with the mean group size centering around 4-6 clients. The outfitting and guiding season extends from April through December. Existing and desired use of the study area by outfitters and guides is presently concentrated in Tom Creek.

Tom Creek area is the most important recreation place.

The Harding River Cabin and the Anan Cabin are the only recreation cabins in the Bradfield. The use levels of the Harding Cabin have remained fairly stable over the past ten years. The Anan Cabin is the most popular cabin on the Wrangell Ranger District. Recreation use in the study area itself is generally concentrated around Frank and Tom Creek. The Tom Creek area is the most important recreation place on the study area based on public scoping for this project, information received from outfitters and guides, the scenic diversity and the presence several lakes.

Commercial shrimpers and crabbers frequent the Bradfield Canal. Occasionally, the Alaska State Ferries have cruised the adjacent Ernest Sound and Blake Passage as a variation on the Ketchikan-Wrangell run, affording passengers a lingering five- to six-minute view of Bradfield canal's first four miles.

The "seen area" can be divided into four areas.

The Campbell study area covers the face of a peak, fronting on the Bradfield Canal. This **"West Face"** is a shallow bowl extending four miles along the inlet, ending in a long, tapering east ridge that blocks most of the view further up the Bradfield. The shape of the bowl is simple, concealing very little, its texture unrelieved by rock features or major openings apart from an alpine fringe at the upper edge and two well-incised drainages converging at the base.

Continuing east, the **"Frank Creek Valley"** divides the west face from, **"Hollywood Bowl,"** a 1200' foot plateau-shaped hill whose south side forms a deep basin. Unlike the west face, Hollywood Bowl's enclosing ridges wrap around a little valley at their center, concealing some of its terrain from view.

To the east of Hollywood Bowl is **"Tom Creek Valley."** Tom Creek is contained on the east by two miles of hummocky, relatively low terrain whose indistinct, multi-summited ridge forms the east boundary of the study area. One mile from the mouth of Tom Creek a very low divide separates this stream from the Harding River, a candidate for Wild and Scenic River status.

Tom Creek has the highest scenic quality in the study area.

Variety Class refers to the scenic quality of a landscape. Generally, landscapes with more variety are rated higher (A) than those with minimal variety (C). The landscape of the **Coast Range** Character type includes many dramatic alpine landforms and fjord-like rock walls, escarpments and spires. Bradfield Canal is a less striking version of this landscape. Most of it is rated as "B", or common, for this character type. The hummocky area in Tom Creek that separates it from the Harding River is rated "A", distinctive due to the presence of Tom and Campbell Lakes and more dramatic rock and terrain features. No "C"--minimal variety--exists in the study area.

The Bradfield Canal is the main travel route.

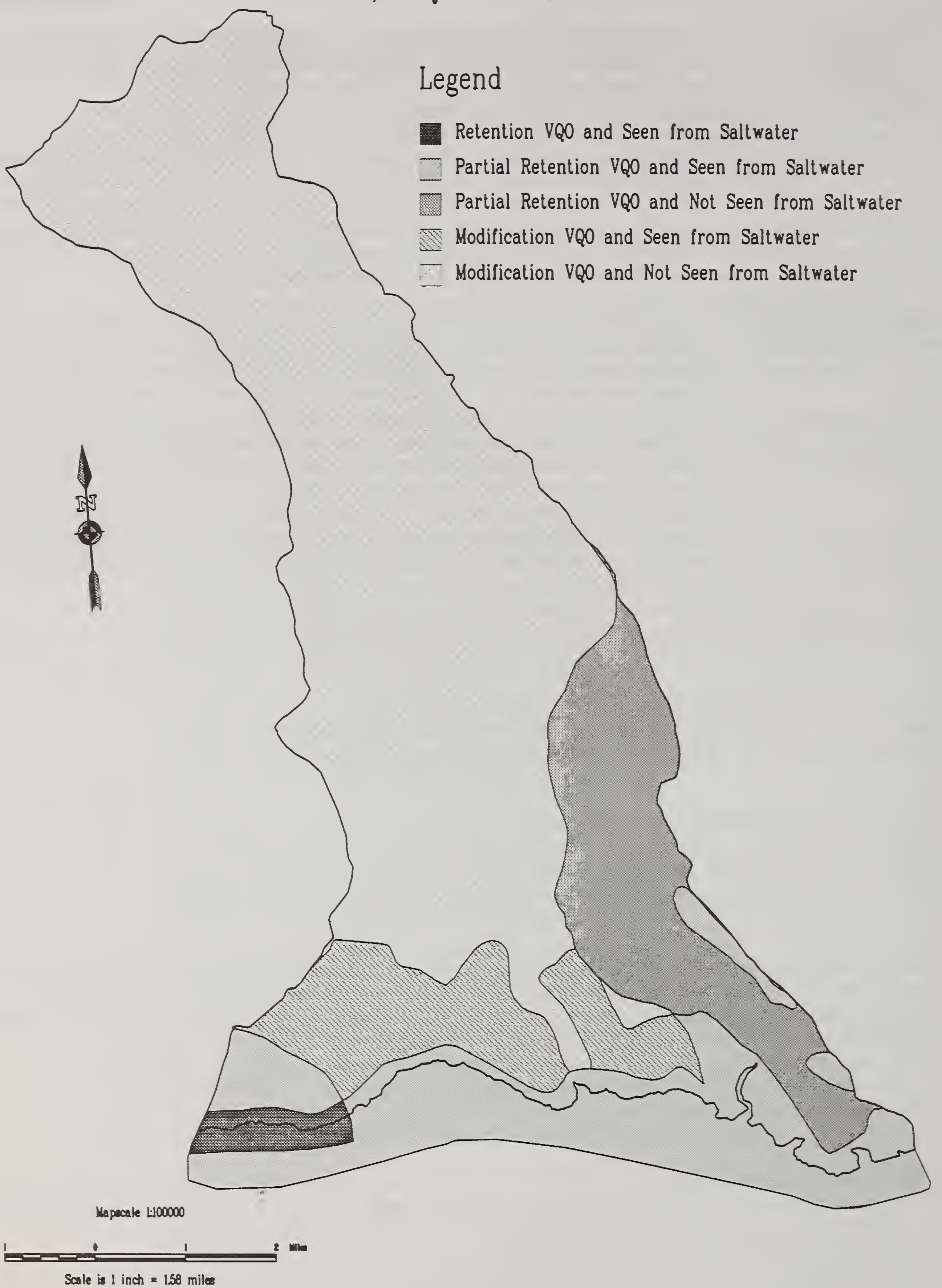
Sensitivity Levels measure the public's concern for the scenic quality of forest lands. In the study area the most sensitive, Level 1 lands are on the south-facing slopes that can be seen by recreationists heading to/from Anan Bay and Blake Channel. Much of the rest of the study area which is seen from the Bradfield is classified as Level 2, reflecting the status of the canal as a secondary travel route. "Unseen" areas from the canal which include the majority of the VCU are classified as Level 3.

Visual Quality Objectives (VQO's) are an indication of the inventoried value of the landscape's scenery. Three factors make up the VQO: the closeness of the viewers to the landscape (foreground, middleground and background), the sensitivity level of the viewers, and the variety class. In general, those areas shown in Figure 3-8 as "Retention or Partial Retention" have a higher value than those shown as "Modification." However one exception exists. Although the beach fringe areas along the steep West Face by definition are closer to the viewer and therefore rated higher by the inventory, an important aspect of this area is the absence of a good separation between the foreground and middleground. Therefore, functionally the area should be treated as one visual unit because there is no distinct separation between the observer and the base (NF Landscape Management, Vol.2, Ch.5).

The study area presently appears unmodified.

The Existing Visual Condition of the entire study area is classified as unmodified (EVC Category 1). The **Characteristic Landscape** of the study area is relatively homogeneous in appearance with alpine and scrub forest areas adding some visual variety and texture to the landscape on the West Face. The valleys of Frank and Tom Creek appear as evenly forested, "rolling hills" to the viewer from the Bradfield Canal. The characteristic landscape appears somewhat different to the hiker traveling up the Tom Creek valley. This landscape has more vegetative variety (a mix of forest and muskeg), water features and more dramatic peaks and mountain tops. in the Bradfield area, there are areas where denser forest gives way to scattered trees near alpine. This gives the viewer a sense of already existing "texture" in the landscape which is an important characteristic when planning vegetation management activites.

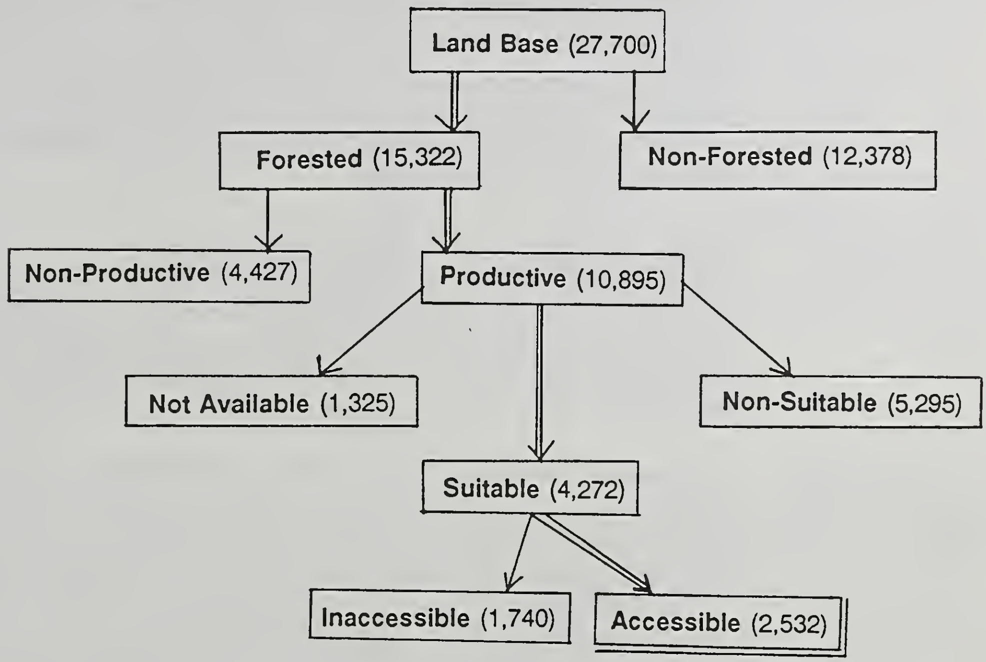
FIG. 3-8, VQO's AND SEEN AREA



Timber Harvest and Production

There are approximately 27,700 acres of land within the zones of the Campbell Project Area. Depending on the vegetative cover, this land has been classified for its value for timber production. Figure 3-9 illustrates the classification matrix.

Figure 3-9, Timber Lands Classification Matrix



Forested Land refers to National Forest lands that consist largely of timbered vegetation; it is further categorized as Productive or Non-Productive Land.

Non-Forested means National Forest Land that is unable to support a cover of predominately forested vegetation. This includes muskegs, rock-outcroppings, talus slopes, and lakes and streams.

Non-Productive means forest land that does not support enough timber volume to meet the criteria of commercial forest land.

Productive (Commercial Forest Land) means land that is capable of producing continuous crops of timber. TLMP specified that in order to be capable of commercial timber production, the land must be able to produce at least 20 cubic feet/acre/year, or inventoried as having atleast 8 thousand board feet (MBF)per acre.

Not Available These areas include the productive forest land that has been withdrawn from timber production and is not available for harvest. These lands include: 100-foot buffers mandated by the Tongass Timber Reform Act (TTRA) on certain fish-bearing streams, 500- foot buffers around saltwater shoreline, 1,000- foot buffers around estuaries, and 330-foot buffers around all known eagle nests.

Non-Suitable Land These Lands are identified as Productive Land that contain at least 8 thousand board foot of timber per acre but are not suitable for timber production. Non-Suitable lands are those in which potential resource damage could occur due to unstable soils or oversteepened slopes, poor probability of regeneration, irreversible resource damage to soil productivity, water quality or watershed conditions.

Suitable Land These lands are identified as having the biological capability, and availability, to produce industrial wood products. To be considered Suitable, land must be capable of harvest with available technology to ensure timber production without irreversible resource damage to soil productivity or watershed conditions, be capable of being restocked within 5 years after final harvest, and not be withdrawn from timber production by Act of Congress. Suitable lands are further categorized as accessible or inaccessible.

Some lands are a suitable/ non-suitable complex.

Some lands within the Campbell study area which are classified as "suitable" are a complex of suitable/non-suitable areas. Due to the geologic conditions, these sites contain patches of suitable areas interspersed by rock outcrops or erosive soils. Since the helicopter is the predominant yarding method, these complexes were classified as suitable since they can be logged by helicopter. If harvested, only the suitable microsites would actually be cut.

There are 2,532 acres with potential for timber production.

Accessible These lands have been identified as site specific areas available for timber harvest supported by a transportation network. Within the study area these lands extend 1 mile from shore or the end of planned roads. Accessibility for timber production in the study area is difficult and expensive. Harvest methods rely mostly on helicopters for access. Roads simply provide further access up Frank and Tom Creek for the helicopter. Part of the transportation network relies on saltwater for direct drops and transport of logs. Three separate transportation systems are needed to log all the accessible portions of the study area: 1) the west face drop area and sortyard/LTF, 2) the Frank Creek road and LTF and 3) the Tom Creek Road and LTF.

Inaccessible These lands have been identified as being more than 1 mile from shore or the furthest extent of feasible roads. Physical limitations make harvesting of trees extremely uneconomical under current technology and economic conditions.

Figure 3-10 shows the distribution of the suitable timber harvest lands and the extent of the accessible lands. Table 3-8 shows that most of the accessible timber lands are located in the Saltwater Uplands. The percentages shown in Table 3-8 reflect the percentage of the zone by class. The table shows that 39% of the Saltwater Uplands are accessible. The Freshwater Influence Zone has the second greatest timber production capability of the three zones that support potential timber harvest.

Table 3-8, Timber Land Classification by Ecological Zone (% of each zone in a certain classification is shown.)

Zone	Total Acres	Forested Acres	Productive	Suitable	Accessible
Saltwater Influence	857	811 (94%)	774 (90%)	0 (0%)	0 (0%)
Freshwater Influence	6,378	3,814 (60%)	2,247 (35%)	1,241 (20%)	698 (11%)
Alpine/Brush	11,125	1,357 (12%)	0 (0%)	0 (0%)	0 (0%)
Saltwater Uplands	3,258	3,258 (100%)	3,149 (97%)	1,271 (39%)	1,271 (39%)
Interior Uplands	6,082	6,082 (100%)	4,625 (76%)	1,760 (29%)	563 (9%)

Commercial forest land in the Tongass National Forest has been classified into four volume classes. These volume classes were obtained from the TIMCLU GIS Data Base. Field crews conducted on the ground evaluations and verifications of volume classes of most accessible areas. Timber cruise information from the 1984 sale was analyzed and also used in verification and updating of the TIMCLU Data Base. Table 3-9 displays the volume range for each volume class and the total acres of productive, suitable and accessible volume classes in the study area. Figure 3-11 shows the distribution of these volume classes throughout the accessible lands.

Table 3-9, Timber Volume Classes in the Study Area

Volume Class	Range of Volume	"Productive" Lands	"Suitable" Lands	"Accessible" Lands
4	8-20 MBF/Acre	4,711 acres	1,384 acres	722 acres
5	20-30 MBF/Acre	5,254 acres	2,453 acres	1,608 acres
6	30-50 MBF/Acre	930 acres	441 acres	202 acres
7	50 or greater MBF/Acre	0 acres	0 acres	0 acres

FIG. 3-10, PRODUCTIVE FOREST LANDS

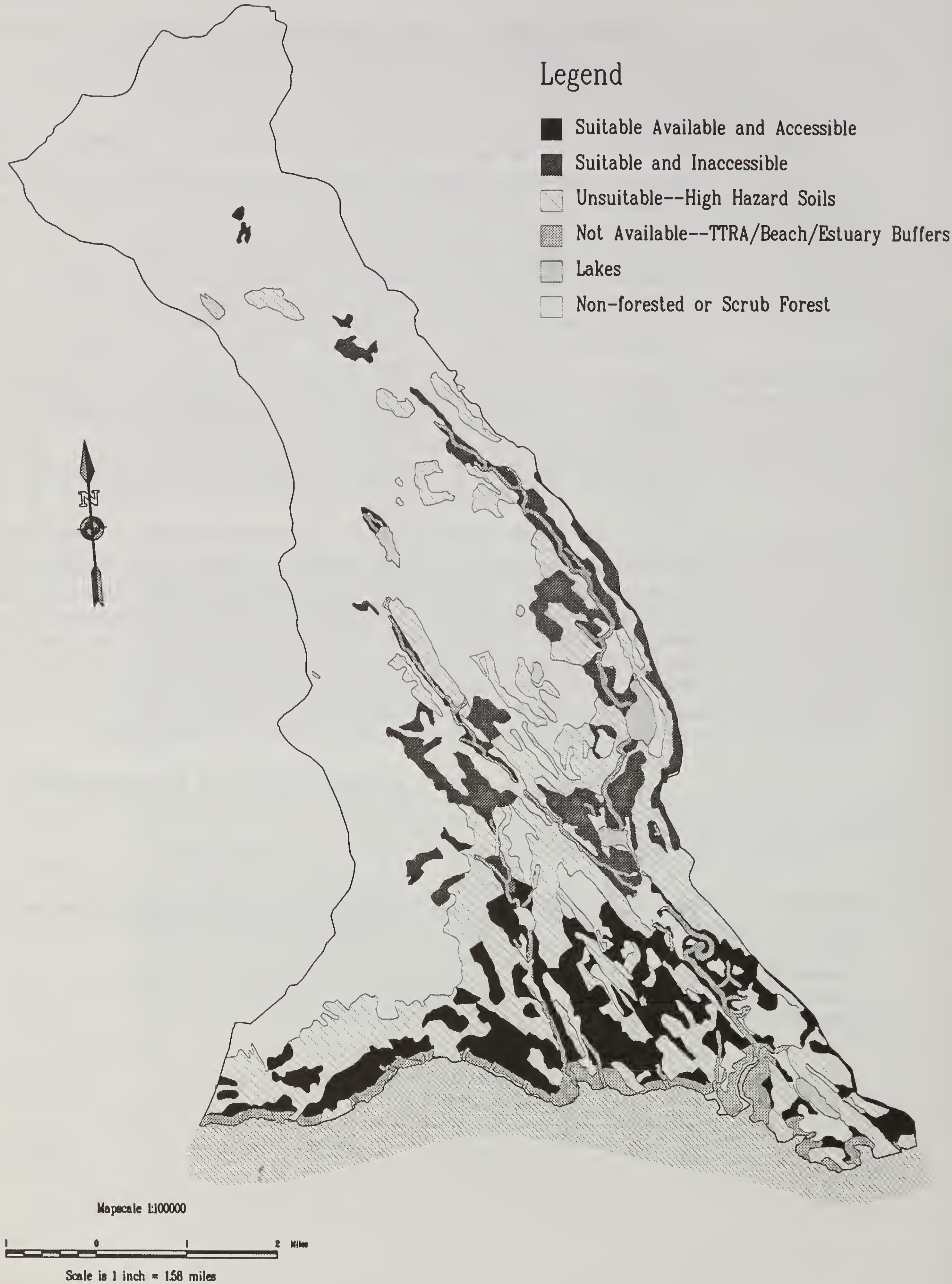
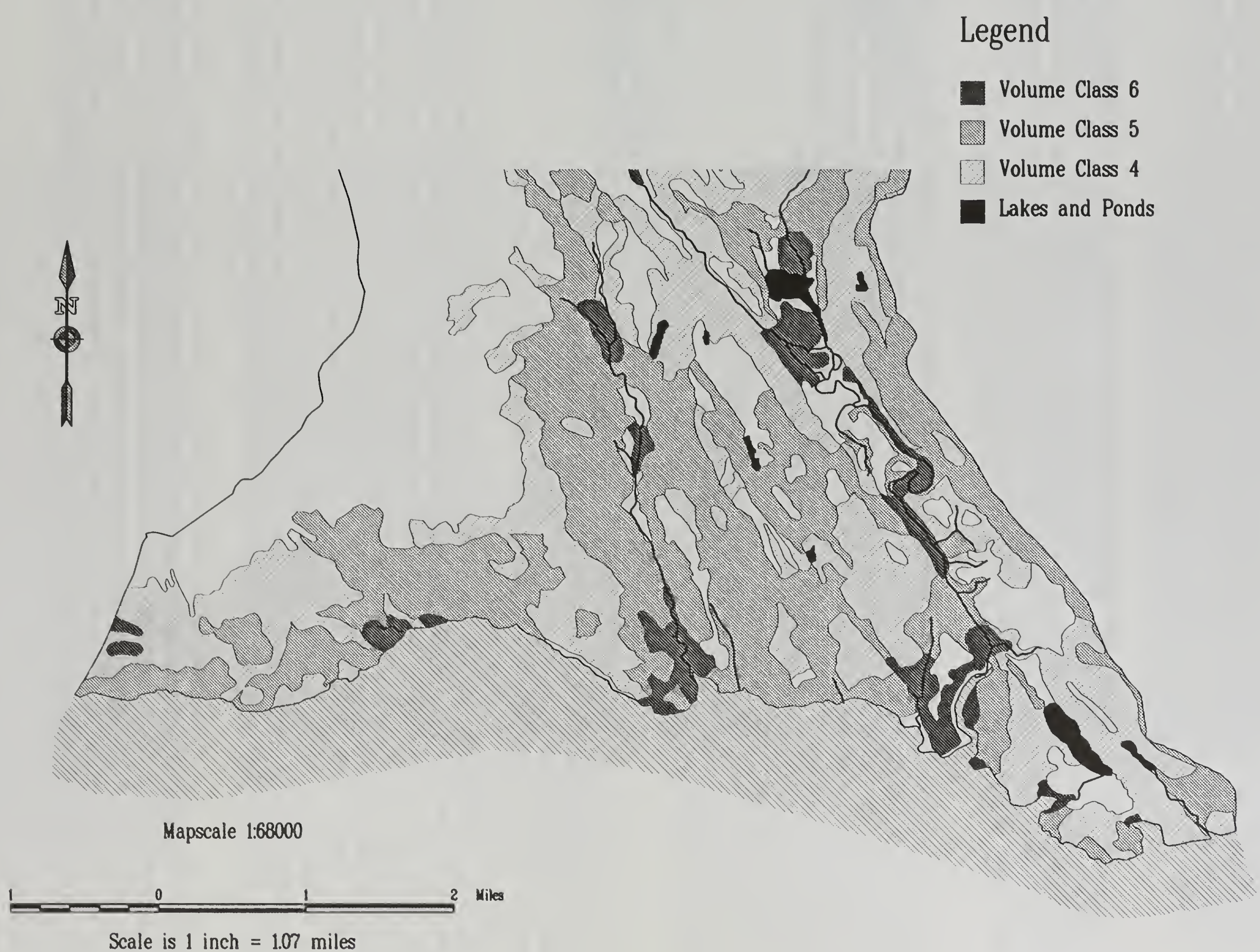


FIG. 3-11, TIMBER VOLUME CLASSES



Area Rural Development

The Tongass Land Management Plan dedicates a large portion of the Bradfield Canal area to non-timber production allocations such as primitive and semi-primitive areas. These designations reflect the general poor quality of the mainland timber producing lands and the high values for wildlife, fish and recreation. The Campbell VCU is surrounded by semi-primitive and primitive areas to the east and west. The only other timber production allocation in the canal, is located to the south of the study area and is also surrounded by primitive and semi-primitive allocations. The Bradfield River VCU's, further inland of the canal, are allocated to timber production but most of the timber has already been harvested.

The Bradfield Canal landscape could change if all planned and proposed development takes place. In addition to the proposed Campbell Timber Sale, the Tongass 10 year harvest plan proposes that the area immediately to the south be considered for a timber sale (Canal-Hoja Timber Sale) in 1996. Several road and utility corridors are also proposed. Although the timeline on these is extended and uncertain, they could have a dramatic effect on the numbers of people using the area.

Increased recreation and tourism is also likely in the area over time as independent and guided visitors search for increasingly rare natural looking areas with access. Tourism could become increasingly important in the near future as Wrangell and the surrounding communities attempt to stabilize their economies by stimulating economic diversity. The Bradfield area offers much in the way of these opportunities as long as the attractions; fish, wildlife and scenery are maintained.

Ecological Zones

We divided the study area into six ecological zones (See Figure 1-2 and Figure 3-12). In the following discussion we describe the major ecosystem processes occurring in each zone and how they relate to planning issues outlined in Chapter 1.

The Marine Zone

The Marine Zone includes those bodies of saltwater of Bradfield Canal in the study area: deep water as well as estuarine habitats. The Marine Zone meets the Saltwater Influence Zone at the mean higher, high tideline (See Figure 3-12). Saltwater is used as a staging platform and transportation medium for timber harvest activities. The construction and use of Log Transfer Facilities and transport of harvested logs could affect the productivity and function of the marine system (See Planning Issue #3, Chapter 1). Effects on the productivity of the marine system could affect the use of these areas by fishermen. The actual logging itself may also temporarily displace the users of the Bradfield area (See Planning Issues #8 and #9, Chapter 1).

Sensitive habitats include tideflats, salt marshes, kelp and eelgrass beds, and shellfish concentration areas. These relatively shallow areas are highly productive for a number of reasons and serve as "nurseries" and rearing areas for a number of shellfish and finfish species. These areas are also important to resident and migrant waterfowl. The saltwater habitat is divided into zones based primarily on natural processes related to depth and movement of water: 1) estuarine; 2) intertidal; and 3) offshore.

Estuaries

An estuary is defined as the interface where freshwater drainage from the surrounding hillslopes mixes with saltwater. The boundaries of estuaries usually are represented by some combination of salinity and depth. The more productive estuaries are semi-enclosed by land and include bays, coves, harbors, and inlets. Those areas that have salt marshes are the most productive. This area of varying saline concentrations is critical in the life of some species, the better known of which are salmon and shellfish. Adult salmon use estuaries as staging areas for upstream migration and juveniles and smolts use them as rearing areas.

There are three estuaries in the study area.

Any area where saltwater and freshwater mix can be considered an estuary. For management purposes there are three defined estuaries in the project area which are buffered (the 1000 foot buffers lie in the Saltwater Influence Zone, See Figure 3-12). The most important of these estuaries are located at the mouth of Tom and Frank Creeks. The bay to the east of Tom Creek is also considered to be a small estuary.

Estuaries are nutrient rich areas important to many species.

All estuaries have two things in common: 1) the harshness of the physical and chemical environment; and 2) the high concentration of nutrients. Environmental harshness is created by gradients in salinity and temperature resulting from the mixing of fresh and saltwater. The abundant nutrients combined with shallow conditions and warmer temperatures cause the estuaries to be rich in phytoplankton, and hence zooplankton and fish. Several features of estuaries contribute to the "trapping" and recycling of nutrients, the most subtle of which is the saltwater itself which causes nutrients to drop out or be pushed back to the head of the estuary. Productivity of estuaries is a function of the freshwater-saltwater mixing which results in the deposition of dead organic matter (detritus) for recycling by invertebrates and the localized concentration of nutrients in solution.

Intertidal Area

The intertidal area is most often defined in terms of political jurisdiction: that area of periodically submerged land between mean higher, high tide and mean lower, low tide. Basically, it is that area commonly known as "beach" that is exposed between the highest and lowest spring tides. Only a very few specialized plants and animals use this area permanently. The mobile animals that visit this area on the tide are primarily opportunists coming to graze or prey on other inhabitants or otherwise exploit the concentration of nutrients created by water contact and light penetration. Productivity of intertidal areas is primarily a function of slope, surface coarseness or irregularity, and deposition/displacement of detritus. The two types of intertidal areas found within the study area include rocky and sand/gravel beaches. Both are important rearing areas for the younger life stages of shellfish and finfish. Coastal areas with steep, rocky intertidal shores near peninsulas are favored by otters because these areas attract the fish that otters eat. Short steep intertidal areas on rocky points, which are especially abundant on the western half of the study area, are optimal for river otters.

Offshore Area

The offshore area extends from the low-water tide mark and includes the nearshore and deep water areas. Productivity of this area is a function of water circulation and light penetration. Upwellings bring nutrients up from the bottom to be recirculated in the upper portion of the water column. An important part of the offshore area are the nearshore submerged lands. This area lies adjacent the intertidal zone. This is where most commercial shellfishing and sport finfishing takes place within the proposed operating area due to the concentrations of adult species found there associated with other elements of the food chain. Small Numbers of harlequin ducks were commonly seen in the nearshore water within 1/2 mile of the Tom Creek estuary. The boundary of this zone is usually defined by depth.

Nearshore areas are important areas for fishing.

Several species use both nearshore and offshore environments. Seals are common in the waters adjacent to the study area and feed on salmon and other fish returning to Tom and Frank Creeks. Approximately a dozen harbor seals (*Phoca vitulina*) used a haul-out about a mile east of the mouth of Tom Creek in late summer 1992. Marbled murrelets were commonly seen in the nearshore and deep water areas of the Bradfield Canal in 1992. A density of 7 murrelets per km² was found in July 1992 during near-shore surveys along the north shore of the Bradfield Canal. Stellar sea lions are a threatened species that could occur in the marine zone of the study area. No Steller sea lions were sited by Forest Service personnel in the Bradfield Canal during 1992, and no rookeries or haul outs occur nearby (S. Zimmerman, NMFS, correspondence dated 2/8/93). However, sea lions are known to occur in Earnest Sound and other nearby waters.

The offshore zone contains potential habitat for the endangered humpback whale. No humpback whales were seen in the area during presale activities in 1992 and there are no records of any sightings in the Bradfield Canal (E. West, the Nature Conservancy, correspondence dated 9/23/92). However, they have been recorded in Ernest Sound and other waters adjacent to the Bradfield Canal.

The Saltwater Influence Zone

Vegetation structure, south facing slopes, low elevation, and proximity to saltwater are characteristics of this zone that contribute to its particular importance to wildlife (See Planning Issue #2, Chapter 1). Due to these factors and access they have been especially important to the culture of southeast Alaskans for centuries (See Planning Issue #8, Chapter 1). Although timber harvest does not occur, transportation systems will be constructed and operate within this zone pictured in Figure 3-12.

Habitat Relationships

The habitat capability models indicate that this zone has, on average, the most valuable habitat for deer, brown bears, marten and hairy woodpeckers (See Table 3-10). The old growth forest structure stimulates understory vegetation production and provides snow interception. The additional influences of south facing slopes, low elevation, and the close proximity of salt water increase local temperatures, thus reducing snow accumulations. These processes make the Saltwater Influence Zone the most valuable for marten and deer winter habitat (See Table 3-10 and Figure 3-13 and 3-15) on the study area. Reduced snow levels make marten prey and deer forage more available. Deer occur in the study area but populations are not large and traditional hunting use is low. Marten populations in the study area are apparently in good condition (ADF&G 1991).

FIG. 3-12, ECOLOGICAL ZONES

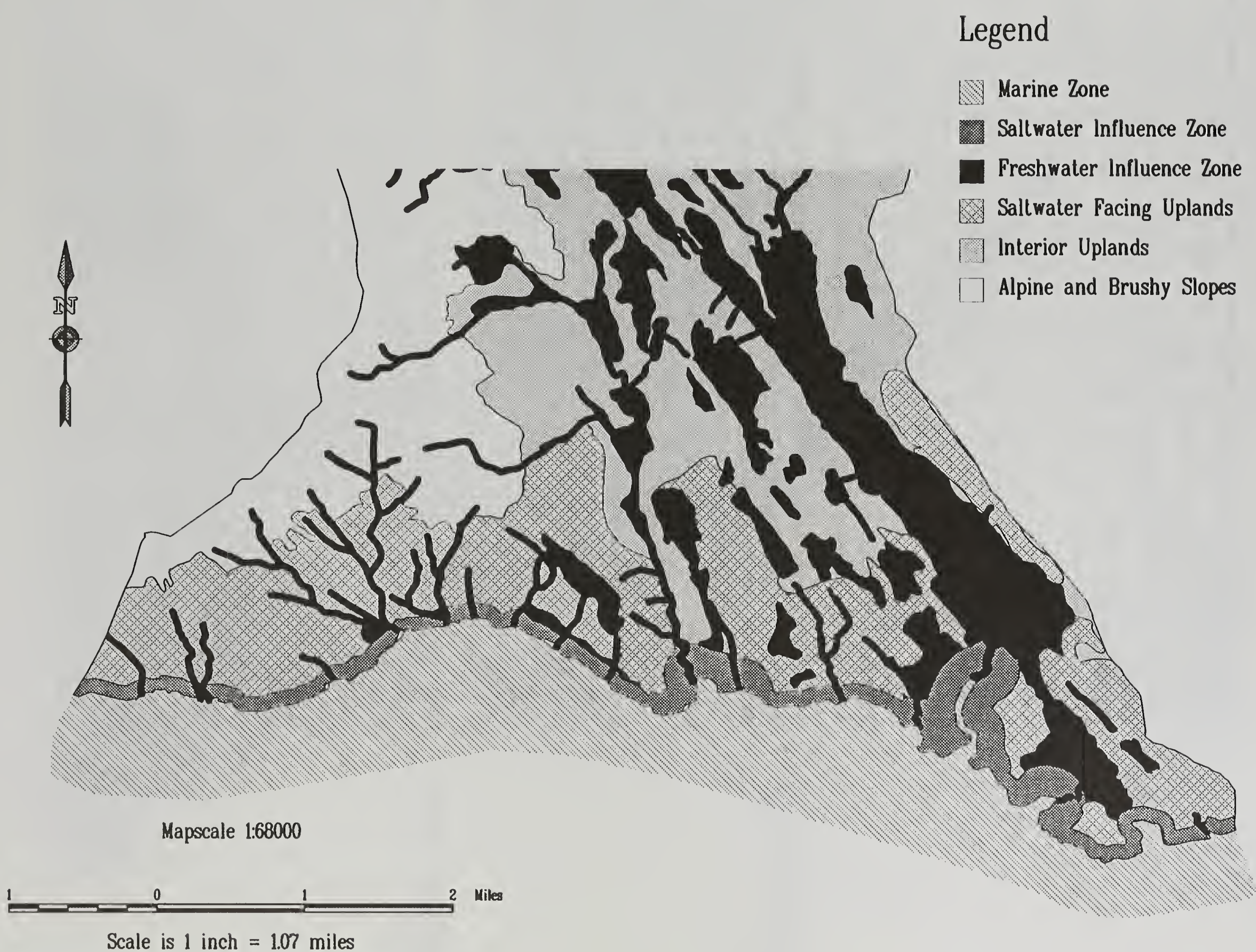


Table 3-10, HSI Value & Rank By Zone

Species	Ma-rine	SIZ	FIZ	Salt-up	Int-up	Alpine
Brown Bear, HSI	0	0.50	0.30	0.35	0.35	0.21
Brown Bear, HSI rank	6	1	4	2	3	5
Deer, HSI	0	0.39	0.10	0.27	0.19	0.00
Deer, HSI rank	6	1	4	2	3	5
Goat, HSI	0	0.14	0.07	0.24	0.17	0.05
Goat, HSI rank	6	3	4	1	2	5
Marten, HSI	0	0.83	0.31	0.57	0.46	0.01
Marten, HSI rank	6	1	4	2	3	5
Hairy HSI	0	0.52	0.20	0.41	0.32	0.00
Wdpck, HSI rank	6	1	4	2	3	5

Snags provide forage, denning and nesting areas.

The dynamic age structure of old growth forests provides a constant supply of snags and large trees that are important habitat components for hairy woodpeckers and marten. In the plant associations predominating on the study area (western hemlock and Sitka spruce) there are an estimated 2 - 14 snags per acre that are greater than or equal to 15" dbh (B. Pawuk, USFS, unpubl. data). Hairy woodpeckers are primary cavity excavators, which means they create cavities which may be used by other bird and mammal species after the woodpeckers vacate them. They typically excavate nests in snags and live trees with heart rot. Their preferred habitats include high tree basal area, tall canopy, and large diameter trees (Connor and Adkisson 1977 from TLMP SDEIS)and therefore the HSI values show the importance of this zone (Table 3-10 and Figure 3-14). Snags and down dead wood provide cover (dens) for martens and habitat for their prey. River otters use cavities between large rocks and under large snags and live trees for den sites (Larsen 1983).

Eagles usually nest in this zone.

The presence of large, flat-topped, open crowned trees and snags provide ideal nesting and perching sites for bald eagles. The multi-level canopy allows access to those trees while the adjacent marine zone provides access to food. All known bald eagle nests within the study area are in this zone. Aerial surveys conducted by the US Fish and Wildlife Service prior to 1992 located 4 nests (US Fish and Wildlife Service bald eagle nest atlas). Two are located near the mouth of Tom Creek and the other 2 are located in the beach fringe along the West Face. Two nests, one each at Tom Creek and the West Face could not be found during aerial, boat and ground surveys in 1992. These nests were also not located by the FWS on their last survey in 1987. An additional nest was found by Forest Service personnel in 1982 on the peninsula west of Frank Creek and was relocated in 1992. All three nests that were located in 1992 were active. However, only the nest along the West Face produced young. The nest at Tom Creek had eggs in April but the adults were not seen at the nest later in the year and evidently abandoned the nest. Adults were seen at the nest near Frank Creek but no eggs or young were ever seen.

FIG. 3-13, MARTEN HABITAT

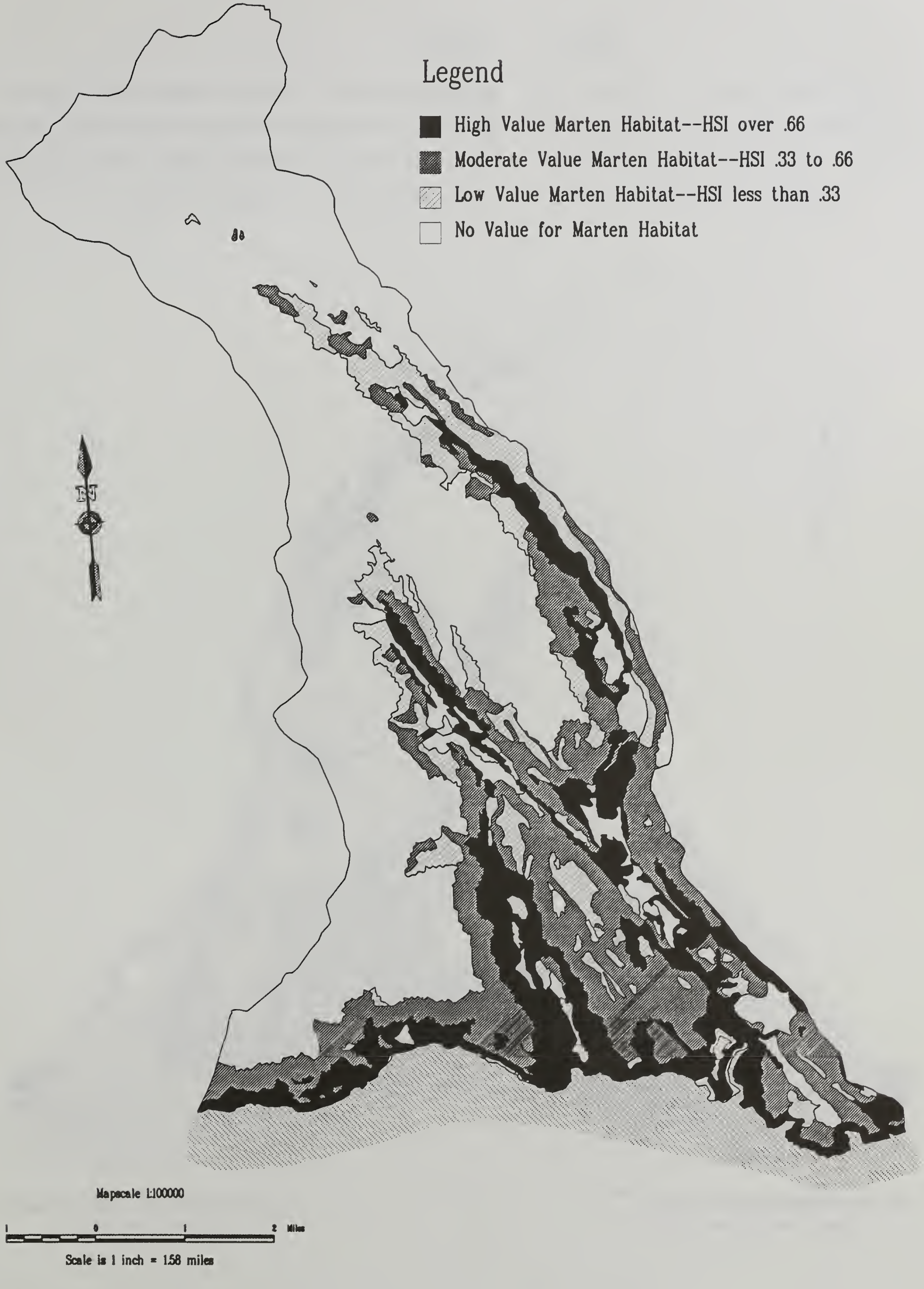


FIG. 3-14, HAIRY WOOODPECKER HABITAT

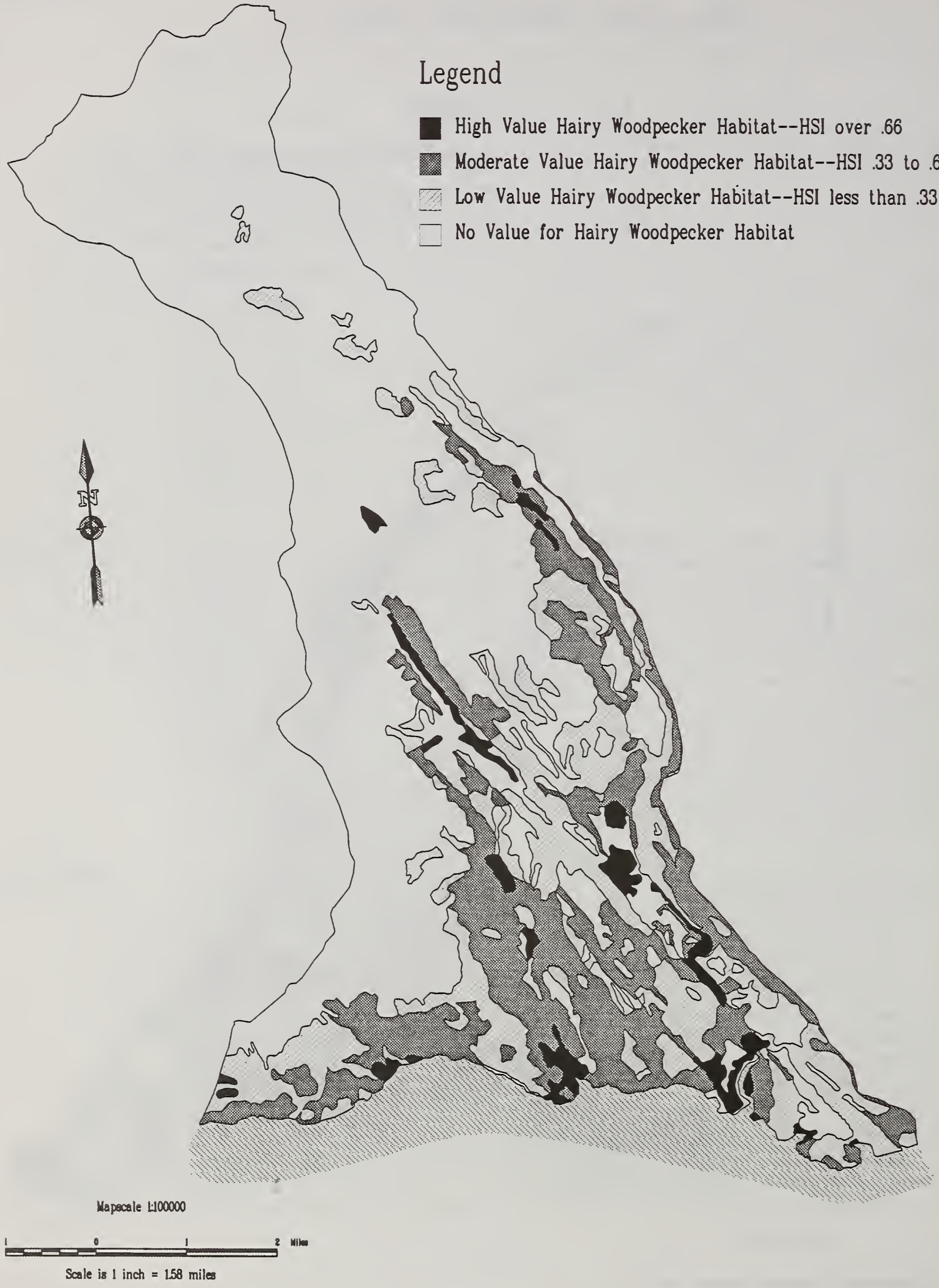


FIG. 3-15, DEER WINTER RANGE

FIG. 3-16, BROWN BEAR HABITAT

There were 2 possible sittings of goshawks on the study area reported in 1992, one of which occurred in this zone. The forests in this zone (as well as the freshwater influence, upland interior and upland saltwater-facing zones) could provide potential nesting and foraging habitat. However, surveys conducted in July using recorded wailing and juvenile begging calls did not elicit any responses. Use of this zone by murrelets for breeding is possible because many of the murrelets seen were paired and young of the year were seen in late summer. However, it is not known whether they nest in coastal or upland forests in Alaska (Mendenhall 1992).

Sedge meadows are important to waterfowl and bear.

The small patches of sedges and grasses that occur along the upper beaches and in the bays and estuaries are the first areas for vegetation to sprout in the spring. This provides foraging sites for bears and Vancouver Canada geese in early spring. The importance of these sites is reflected in the high habitat suitability values for brown bears in this zone (Table 3-10, Figure 3-16) and is confirmed by observations of bears and geese and their sign at these sites. The sedge meadows adjacent to the intertidal mudflats at Tom Creek provide important feeding and resting areas for migrating waterfowl and shorebirds.

Corridors

The Saltwater Influence Zone is an important travel corridor for wildlife in the study area. This zone will become particularly important if harvest occurs on the uplands adjacent to this zone. The specific areas of this zone which are most important to wildlife lie along estuaries and the west face of the study area. This zone is also important to the viewer's perception of the scenery, offer opportunities to see wildlife and are also key areas for recreation activities.

The Freshwater Influence Zone

Although all zones have important elements and processes occurring within them, this zone can claim the distinction of providing the greatest linkages between zones. This linkage is not only physical but functional in that water, nutrients, wildlife and people flow between other zones using the pathways of the Freshwater Influence Zone. The productivity and function of this zone is one of the key planning issues (See Planning Issue #1, Chapter 1).

Water influences all of the zones defined for this analysis, but is, by definition, concentrated in this zone. The zone encompasses all open channel systems, streamside zones, high hazard soils adjacent to streams, lakes, all riparian soils, non-forested wetlands, and forested wetlands in a complex with non-forested wetlands. Table 3-11 illustrates the various components three main watersheds. The small west face watersheds were combined under this table. The location of these watersheds is shown in Figure 3-4.

Table 3-11, Components of the Freshwater Influence Zone

FIZ Component	West Face Watersheds	Frank Creek A27A	Tom Creek A30
Riparian Soils	19 acres	39 acres	340 acres
TTRA Buffers	6 acres	120 acres	683 acres

Table 3-11, Components of the Freshwater Influence Zone (continued)

FIZ Component	West Face Watersheds	Frank Creek A27A	Tom Creek A30
AHMU Class 3 Buffers	329 acres	148 acres	1348 acres
High Hazard Soils	0	0	21 acres
Muskegs	0	315 acres	1880 acres
Lakes	0	8 acres	187 acres
Lake Buffers	0	10 acres	142 acres
Wetland Complex	0	0	88 acres
Misc. Upland Inclusions	0	0	102 acres
Total FIZ Acres	487 acres	640 acres	4791 acres

The breakdown of zones in the 3 largest watersheds on the study area are given in Table 3-12. The table illustrates that most surface and near-surface water processes (Freshwater Influence Zone) occur in the range of 15% to 25% of a watershed's total area. These watersheds are shown in Figure 3-4.

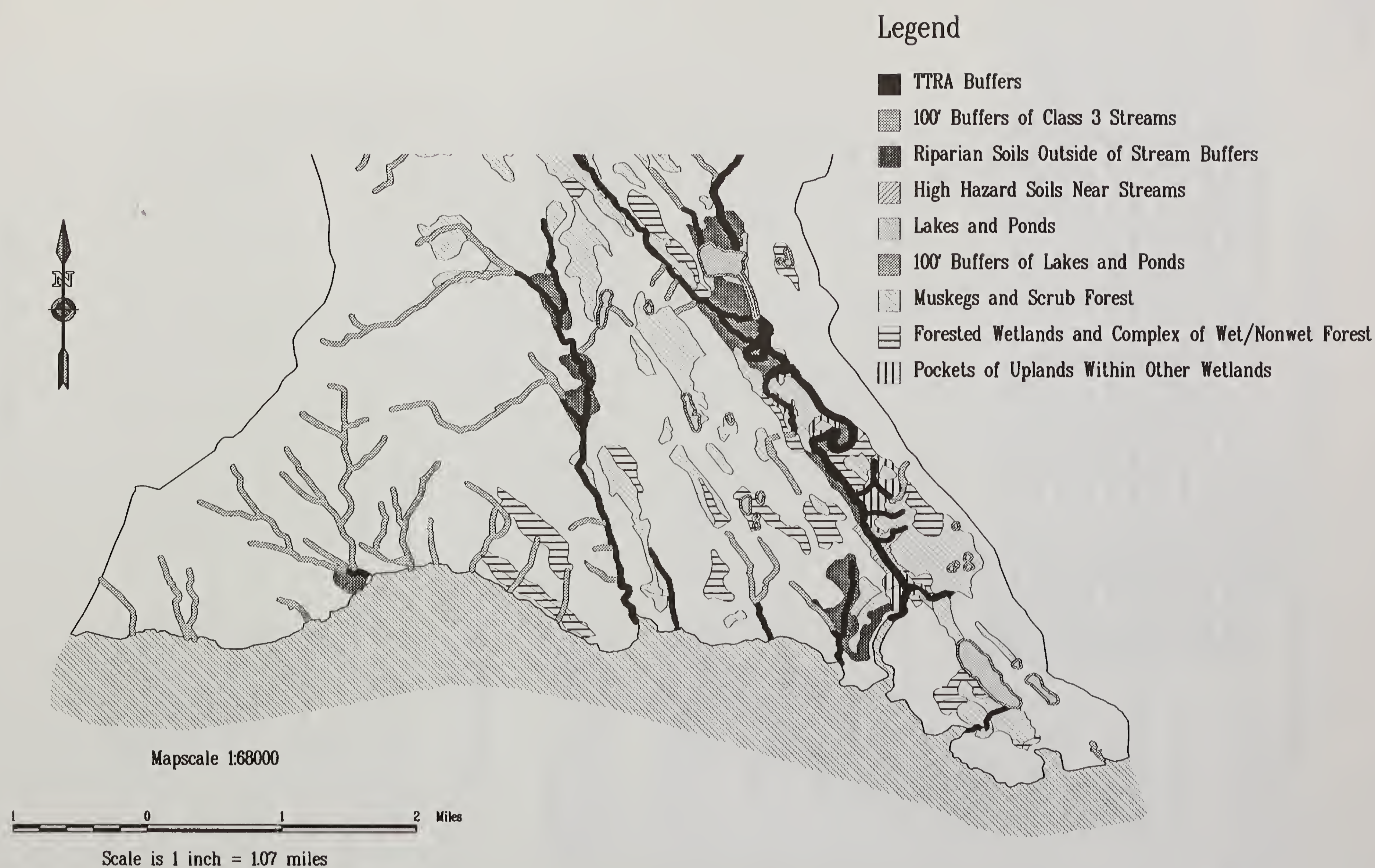
Table 3-12, Zone Breakdowns of Three Watersheds

Zone	A24A, 1005 total acres	Frank Creek, A27A, 3290 total acres	Tom Creek, A30E 19,065 total acres
FIZ	16%	19%	24%
SIZ	<1%	<1%	<1%
ALPINE	49%	29%	49%
SALT-UP	34%	16%	2%
INT-UP	0	36%	25%

The FIZ links all other zones.

The Freshwater Influence Zone is comprised of the **riparian ecosystem,** the **aquatic ecosystem**, and the **wetlands ecosystem**. The components of the Freshwater Influence Zone within the Study Area is depicted in Figure 3-17. The combination of the aquatic and riparian ecosystems is equivalent to the **riparian area** described in the DEIS for the TLMP Revision. The riparian, aquatic, and wetlands ecosystems are linked by natural processes and can only be separated for the purpose of discussion. Water, sediment, and wood, the key constituents of the aquatic ecosystem, have their origin in or pass through the riparian ecosystem. Those habitat elements generated solely within the aquatic environment are regulated or otherwise affected by the adjacent riparian ecosystem. Processes linking the ecosystems include, but are not limited to, windthrow, litterfall, runoff, leaching, erosion, sedimentation, and shading.

FIG. 3-17, COMPONENTS OF FRESHWATER INFLUENCE ZONE



The Riparian System

The riparian ecosystem is defined as the transition between the aquatic ecosystem and the adjacent terrestrial ecosystem. It is identified by hydric (wet) soil characteristics or hydrophytic vegetation communities that require free or unbound water. The National Forest Management Act (NFMA) directs that special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation (36 CFR 219.27).

Water influences the diverse mix of plant communities.

Floodplains in the Campbell Area are found in the broad U-shaped valleys of Toms Creek and Franks Creek, and on several small alluvial fans at the base of steep mountain slopes. Some are dominated by riparian forest vegetation, primarily mixed Sitka spruce/western hemlock plant communities with an understory of devil's club, salmonberry and blueberry. The riparian area also has the greatest percentage of the Mixed Conifer plant association (30% of zone) and Sitka spruce plant association (31% of zone). Soils are typically deep, well drained soils developed in alluvial sand and gravel with relatively thin surface organic layers. Other floodplain areas are wetland freshwater meadows with poorly drained organic soils, such as the area below Tom Lake. Approximately 863 acres of floodplains have been identified in the study area using the soil resource data base for initially determining the location and approximate boundaries of floodplains.

Congress, via the Tongass Timber Reform Act (TTRA), further recognized the many important influences riparian vegetation has on the stream ecosystem by establishing 100-foot minimum streamside buffers along important fish streams . Some of these influences include: 1) falling leaves and needles provide sources of nutrients, 2) insects that fall into the stream supplement the salmonid diet, 3) logs and branches form the channel shape, retain organic matter and sediment, and provide cover, 4) roots stabilize streambanks and maintain undercut banks, 5) tree canopies provide thermal protection and reduce extremes in temperature.

Many species of wildlife use the riparian forest.

The riparian forest is the interface between terrestrial and aquatic systems and provides habitat for terrestrial organisms that utilize the aquatic resources. Large open crowned trees and snags provide perching sites for eagles feeding on salmon along Tom Creek and Tom Lake. Riparian areas with poorly drained soils, skunk cabbage and dense understory provide primary nesting and brood rearing habitat for geese (Lebeda and Ratti 1983). Goslings use the cavities under large trees and dense understory vegetation for hiding cover (Lebeda and Ratti 1983). Otters and bears use cavities under large trees and snags for resting and denning.

The riparian forest could provide nesting sites for harlequin ducks. Pairs of harlequins were seen in the marine zone during summer, suggesting breeding is possible. No young were seen however. The swift upper reaches of Tom and Campbell Creeks are the most likely places for harlequins to nest.

The Aquatic System

The aquatic system is comprised of streams, lakes, and ponds and the biota supported by these waterbodies. Aquatic ecosystems perform functions of particular importance to humans. The basic element of these systems is water, the foundation of life support. Water, and the minerals and nutrients it carries in solution, is drained and collected from surrounding hillslopes and transported and distributed by streams. Runoff is stored in lakes, ponds, and wetlands where release is regulated to varying degrees. Not only are nutrients in solution picked up and dropped off, but plant material ranging in size from spores to whole trees and sediment ranging from silt to small boulders are stored and redistributed as well.

The key habitat elements of the aquatic ecosystem are **water temperature**, **sediment**, and **large wood**. The general productivity of streams depends upon these basic elements. Water temperature regulates the general pace of activity and rate of production in aquatic ecosystems. Each aquatic organism has an optimal temperature or range of temperatures at which it grows and functions as well as thresholds at upper and lower extremes at which certain functions slow down or cease altogether. Extremes in water temperature are modified by water depth, tree canopy, and groundwater upwelling. Removal of any one of these elements increases the effects of the extremes.

Sediment and gravels provide a chamber for incubating fish eggs as well as habitat for aquatic insects, a trap for fine organic matter, and a site for nutrient spiraling. There is an optimal size of sediment for each family of organisms and life stage of an organism. Large wood has many functions in aquatic ecosystems. As a coarse structural element in flowing water, it traps and stores sediment upstream, and downstream it creates turbulence that provides cover for fish from above, scours sediment to create pools and clean gravels, and creates differences in water velocity for resting and food gathering. Wood provides cover for fish, a substrate for algae growth, a platform for aquatic insects, and an eventual source of carbon and other nutrients.

***A**quatic **H**abitat **M**anagement **U**nits* (AHMU) are defined as geographically definable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems, with a minimum width of at least 100 feet from all perennial streams and bodies of water.

Class I AHMUs contain streams and their associated riparian zones which support anadromous or adfluvial fish including habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish.

Class II AHMUs contain streams and their associated riparian zones which support resident fish populations. These areas generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

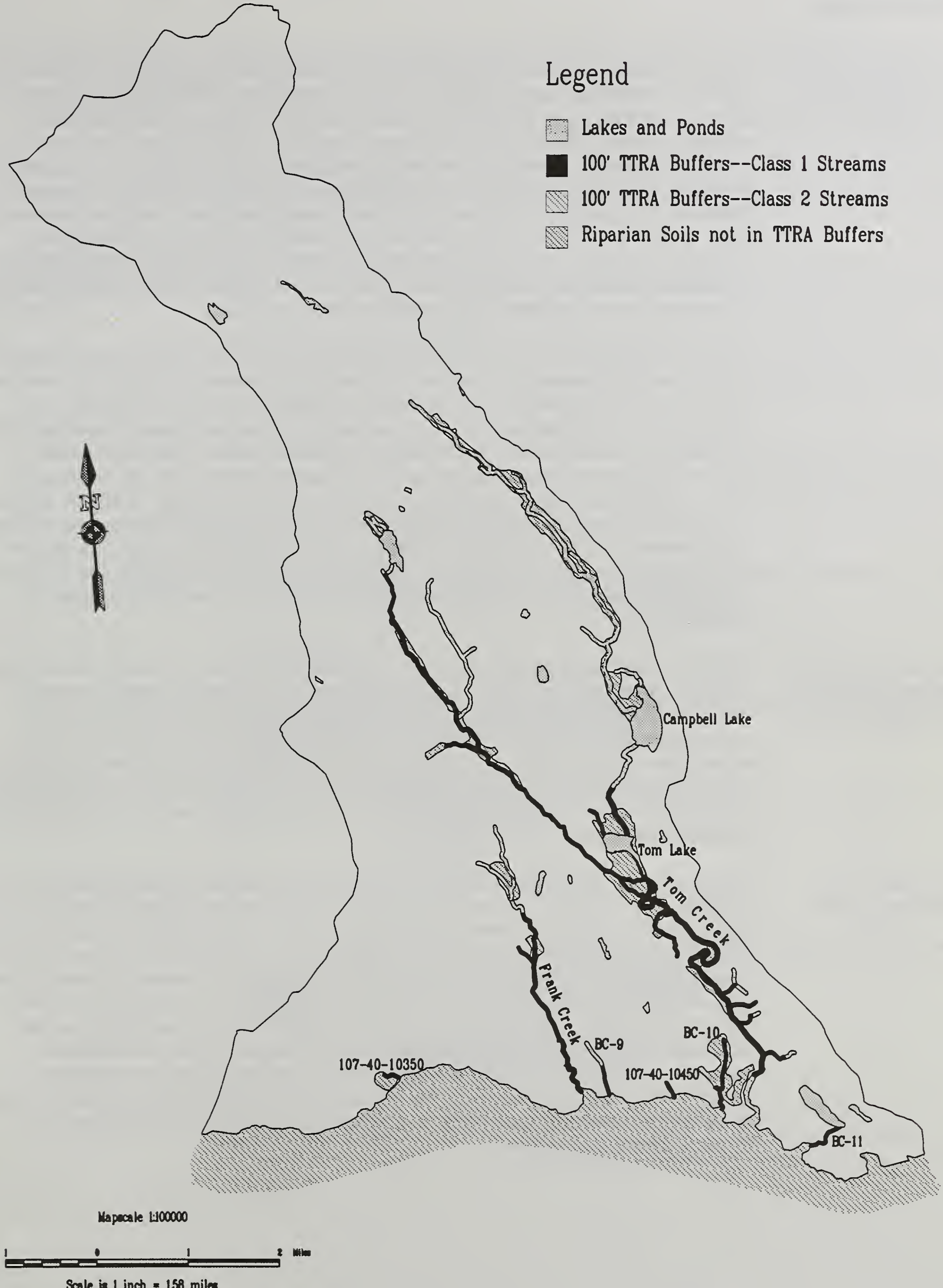
Class III AHMUs include streams and their associated riparian zones which do not support fish populations, but have potential water quality influence on the downstream aquatic habitat.

Class I and II streams are given special importance.

Class I (anadromous) and Class II (resident) AHMU are delineated in Figure 3-18. Comparison with Figure 3-17 shows that these ecological units are part of the more comprehensive Freshwater Influence Zone, which also includes Class III streams as well as wetlands. These Class I and II units are given special recognition due to their high water, fish, and wildlife values focused on by the TTRA.

The boundaries of Class I AMH Units having **constrained** channels, or incised channels confined by bedrock or armored by large boulders, coincide with the boundaries of the TTRA streamside buffer (100-foot minimum) because these channels are not likely to change course over time. Streamside vegetation plays a role in the constrained stream energy budget, but not in channel configuration. Constrained streams tend to be very stable.

FIG. 3-18, AQUATIC HABITAT MANAGEMENT UNITS



Unconstrained channels are more productive and sensitive.

The boundaries of Class I AHMU's having **unconstrained** channels, or channels located on floodplains or alluvial fans, coincide with valley walls or other hard features. These channels lack incision and are bounded by erodable, recently deposited sediments which have not had time to develop a thick organic layer. They tend to be confined almost entirely by streamside vegetation which is difficult to re-establish if the thin organic layer is removed mechanically or by floodwaters. Unconstrained streams are responsive to natural events and land management activities, and are likely to change course over time due to their relative instability. Unconstrained channels tend to be more productive than constrained channels as long as their integrity is maintained. Larger streams, third-order and higher, tend to have a mix of constrained and unconstrained channel sections.

Stream channels on the Tongass National Forest have been classified and mapped using channel types--a physically based system which allows for comparing channels of similar form and function. A description of the physical characteristics and management considerations of the approximately 38 channel types is provided in A Channel Type User Guide for the Tongass National Forest, Southeast Alaska (R10-TP-26). Channel types have further been grouped by the stream processes which formed them, reflecting the long term interaction of geology, landform, climate, and resultant vegetation patterns. These process groups explain the basic interrelationships between the runoff, sediment transport, and vegetation patterns of channels so management guidelines and practices developed for each process group would consistently address the various management concerns of the different types of channels.

Streams are grouped according to the main management concern.

For timber sale project planning, process groups were further grouped according to two basic management concerns. These include: 1) streambank stability--alluvial channels on floodplains and fans, and some portions of mixed-control channels; and 2). sideslope stability--V-notches of varying depth and other channels where streambank stability is less of a concern. For the management purposes considered here, a sideslope is that length of ground from the bankfull channel to the first major slope break above bankfull. The distribution of inventoried streams in the watershed analysis area is given in Table 3-13.

Most streams are bedrock controlled.

The majority of the inventoried streams are in well-contained, bedrock channels (75 percent; see Table 3-13). These channels are managed for sideslope stability. Despite their bedrock nature, local areas of stream banks may be quite sensitive to disturbance. Since they are contained, most of these channels can route higher flood flows without overtopping their banks and easily transport silt, sand, and material the size of large cobbles. Many of the steep, contained channels on the study area are V-notches with steep, unstable side slopes. A number of these channels, particularly on the west side of the study area where steep mountain slopes extend from alpine to saltwater, lie in the brush-covered scars caused by episodic snow and debris avalanches. The upper reaches of the mainstems of Tom and Frank Creeks are also contained and bedrock controlled, but have more moderate gradients than the V-notches on the west face.

About 25% of streams are alluvial.

About 25% of streams are alluvial, dependent on riparian vegetation and woody debris for stability, and sensitive to stream bank, stream bed, and floodplain disturbance (Table 3-13). These channels include segments of Campbell Creek above Campbell Lake, Tom Creek downstream of Tom Lake, and on its northwest fork, and portions of Frank Creek. Annual flows (a frequency of once per year) may go over stream banks onto floodplains, fans, and terraces, with the opportunity to both scour backwater or side channels and deposit sediment and nutrients. At higher flows these streams will easily move large gravels, as well as sand and silt particles.

Tom Creek is contained in steep valley walls of sediments.

Lower Tom Creek, below Tom Lake, is unique in its structure. During its development, parts of Tom Creek cut deep into highly erosive, fine-textured sediments, instead of developing extensive floodplains. Floodplain and terrace development is now limited to localized areas within the incised valley. The valley walls have thus become unstable sideslopes adjacent to the mainstem of the channel. These formations are highly variable, however, and areas of floodplains with oxbows, low gradient alluvial fans, and freshwater meadows exist in close proximity to these incised stream reaches.

The mainstem of Frank Creek is another alluvial channel. It lies in a narrow valley which, despite the presence of alluvial materials, constricts floodplain development through local bedrock control points. Floodplains generally do not exceed a width equal to the width of the bankfull channel.

Table 3-13, Distribution of Channel Type Process Groups for All Watersheds.

Managed For	Process Group	Stream Length (mi)
Streambank Stability	1. Low Gradient Floodplain[1]	17.3
	2. Alluvial Fan	2.4
	3. Mixed Control Moderate Gradient[2]	3.3
	7. Placid or Glide	0.6
	8. Estuary	0.7
	9. Glacial Outwash	0.4
		24.7 = 25% of stream length
Sideslope Stability	4. Large Low Gradient Contained	1.2
	5. Moderate Gradient Contained	2.7
	6. High Gradient Contained[3]	71.5
		75.4 = 75% of stream length

[1] **Low Gradient Floodplain** - These channels generally have a rich, abundant community of fish due to good spawning gravels and large wood for good rearing habitat.
[2] **Mixed Control Moderate Gradient** - These channels provide excellent rearing habitat due to large wood accumulations in the streams.
[3] **High Gradient Contained** - These are the smaller, steep, bedrock channels either at high elevation or draining directly into salt water. Fish use of these streams or tributaries is very low.

Otters and bears feed on fish during the runs.

The fish productions of the aquatic ecosystem provides habitat for anadromous and resident fishes that provides an important seasonal food source for bears, eagles and otters. Otters use the streams and lakes for travel as well as feeding on fish. Groups of geese were consistently seen at Campbell Lake, Tom Lake and the lake east of Tom Creek estuary. Campbell Lake in particular seems important for molting geese. The association of muskegs, sedge meadows and the lake provides visibility of predators, forage, and escape. Spotted frogs require lakes and ponds for portions of their life cycle. However, spotted frogs were not found during field surveys conducted in 1992.

Wetlands

Wetlands are defined as areas that are inundated by surface or groundwater enough to support vegetation adapted to wet soils. Wetlands generally include swamps, marshes, muskegs, and similar areas. Wetland delineation involves determination of soil, vegetation, and hydrology indicators (USDA-FS, 1991). Wetlands store water, trap sediment, and store and recycle nutrients. Some of these nutrients are released from impoundment during heavy rainfall events and floods.

About 21% of the wetlands in the area are muskegs.

Like much of Southeast Alaska, the Campbell Area contains a large porportion of wetlands. They are found from sea level to alpine and are comprised mainly of muskegs (21% of wetlands) and alpine/subalpine (61% of wetlands) as well as smaller amounts of freshwater meadows and forested wetlands. Muskegs support unquantified populations of aquatic insects, amphibians, and waterfowl. Wetlands provide corridors, groundwater recharge, flood and sediment control, and water quality enhancement. The Forest Service, as well as other federal agencies, are required by Executive Order 11990 to preserve and enhance the natural and beneficial values of wetlands in carrying out their land management responsibilities. Estuarine wetlands mapped in the study area are small areas near the mouths of Tom and Frank Creeks. Although these intertidal sedge dominated communities are very small (only 27 total acres), they do have significant value as wildlife habitat (See Table 3-14). Approximately 30 percent of the study area is classified as wetland as defined by the Federal Manual for Identifying and Delineating Jurisdictional Wetlands,1989.

Table 3-14, Distribution of Wetlands

Wetland Type	Acres
Muskeg	1,759
Freshwater Meadow	129
Estuaries	27

Table 3-14, Distribution of Wetlands (continued)

Wetland Type	Acres
Forested Wetland	997
Alpine Wetland	5,150
Lakes and Ponds	304
Total	8,366
Percent of Area	30%

Muskegs provide travel-ways for wildlife and people.

While some components of the Freshwater-Influence Zone have high wildlife values, the low wildlife value muskegs result in a low overall rating of this zone for most of the management indicator species shown in Table 3-10. Muskegs have relatively low productivity and thus, are not as valuable for wildlife habitat as other areas or wetlands. However, the long strings of muskegs east of Tom and Frank Creeks provide easy travel routes and are well used by bears during summer and fall. A heavily used brown bear travel corridor linking the Tom Creek and Harding River drainages occurs primarily in this zone. In the densely forested landscape of Alaska, muskegs provide scenic relief and easier access for people too. Geese and brown bears feed on sedges and skunk cabbage in muskegs. The small muskeg ponds and pools may also provide habitat for amphibians.

The Upland Saltwater-Facing Zone

The Upland Saltwater-Facing Zone (See Figure 3-12) has the greatest potential for timber harvest in the study area. Although this zone only represents about 12% of the Campbell study area (VCU 510) it supports 50% of the suitable and accessible timber production area. Since it contains most of the potential harvest units, many of the planning issues are partially or wholely affected by the processes occurring in this zone. For example the effects of harvest on soil productivity and vegetation (See Planning Issue #7, Chapter 1). Large blocks of old growth habitat are presently located in this zone which affect species conservation issues (See Planning Issue #4, Chapter 1) and important south-facing habitats for goats (See Planning Issue #5, Chapter 1). By definition, most of this zone faces toward the Bradfield Canal and is and is seen by visitors to the area. Changes in the seen landscape affects the setting for some of the established uses in the Bradfield (See Planning Issue #8, Chapter 1).

Habitat

By far, the predominant plant association in this zone is the western hemlock or western hemlock-Alaska cedar association (92% of the zone). This zone tends to be more productive due to the south-facing aspect which allows for greater light penetration and a longer season. This zone is also characterized by continuous old growth forest with numerous cliffs and rock outcrops. The forest in this zone connects the saltwater influence, upland interior and alpine zones and is frequently dissected by the freshwater influence zone. These characteristics and interactions with the other zones contribute to the importance of this zone to wildlife (See Table 3-10).

FIG. 3-19, GOAT WINTER RANGE

Cliffy areas with cover are key to goat winter habitat.

Cliffs and rock outcrops embedded in the old growth forest on south facing slopes and adjacent to alpine summer range provide optimal goat winter habitat (Table 3-10 and Figure 3-19). Most of the cliffs along the West Face were field verified in 1991 and 1992. These surveys also confirmed the use of these cliffs and surrounding old growth forest by goats and deer.

The forest processes in this zone are much the same as in the saltwater influence zone with respect to bears, deer, marten and hairy woodpeckers. The main difference being that the higher elevation results in lower temperatures and increased snow loads. Thus, winter habitat values decrease with increasing elevation. The continuous forest cover provides unconstrained pathways for seasonal migrations from the lower elevation to the alpine zone for goats, deer and bear. Forested stands in this zone provide potential nesting habitat for marbled murrelets and goshawks as discussed in the saltwater influence zone.

Scenery

This zone is almost exclusively responsible for the perception that most of the visitors have of the study area. The timber producing lands and the seen area overlap creating a special management challenge.

The Upland Interior Zone

This upland zone, shown in Figure 3-12, has substantially less area for potential timber production than the Saltwater Uplands (22% of the accessible, suitable lands in the study area) because forested areas become more fragmented and less productive away from saltwater. The potential timber producing lands also become harder to reach economically with a road/helicopter combination harvest system. Issues associated with this zone are similar to the Upland Saltwater-facing Zone but potential harvest is not as concentrated in this zone.

Habitat

In most respects this zone is similar to the upland saltwater-facing zone but differences in aspect and distance from saltwater result in colder temperatures and higher snow loads. Plant associations again consist of mainly the western hemlock or western hemlock-Alaska cedar types. There is an increase in the Mountain Hemlock association also. Generally, this zone has less value as winter habitat for the MIS species. However, high elevation old growth forests do provide denning habitat for brown bears. Although the average HSI values in this zone are relatively low, the large acreage makes it important to the total carrying capacity of the study area.

There is a substantial amount of goat winter habitat in this zone (Figure 3-19). In general, the increased snow levels in this zone should make these sites less valuable than those in the saltwater-facing uplands. The cliffs between Tom and Franks Creeks may be even less suitable because they are not associated with an alpine ridge system. This is because goats are not likely to travel far from their summer range (C. Smith, ADF&G, personal comm.).

The large blocks of old growth forest in this zone connect the saltwater facing forests with the adjacent Harding River watershed (Figure 3-6). However, the upland interior forest east of Frank Creek is highly fragmented by muskegs and sparsely forested riparian areas. Interior forest stands adjacent to the freshwater influence zone likely provide escape cover for Vancouver Canada geese broods (Lebeda and Ratti 1983). Forested stands in this zone provide potential nesting habitat for marbled murrelets and goshawks as discussed for the saltwater influence zone.

The Alpine/ Brushy Slope Zone

This zone is the largest and makes up about 40% of the study area. Even though timber harvest activities will not directly impact this zone, it is an important part of the ecology of the area. There are few issues directly associated with this zone except for helicopter flight guidelines near goats during the summer months.

Habitats

By definition the alpine zone includes the high altitude, nonforested lands. The high elevation results in a harsh climate of colder temperatures and heavy snowloads. This zone has a short growing season. There are three distinct vegetation types; herb/heath, brushy and scattered areas of small trees consisting mostly of mountain hemlock. The typical alpine vegetation consists of low growing herbs and heaths interspersed with unvegetated rock outcrops occurs between treeline and the perennial snowline. Brushy areas include alder dominated avalanche slopes and some sparse stands of mountain hemlock.

The avalanche and brushy slopes are important early spring feeding areas for bears and goats because the snow melts faster and the vegetation sprouts earlier than the surrounding forest. They follow the retreating snow line farther into the alpine to feed on freshly sprouting vegetation. Goats and deer remain in the alpine zone throughout the summer but bears may return to lower elevations to feed on fish and early berries.

Chapter 4

Environmental Effects

Chapter 4

Environmental Effects

Introduction

In this chapter we describe the effects of the six alternatives on the environment through the ten key planning issues. This chapter is divided into two main sections:

Effects on the Key Planning Issues- We will describe the effects of each alternative on the ten key planning issues.

Other Environmental Considerations- In this section we discuss some of the other environmental considerations required by various laws.

Effects on the Key Planning Issues

The Council on Environmental Quality (CEQ) issues guidance to the Federal Agencies to determine the significant issues concerning any proposal and eliminate those issues which are not significant. With the help of the public and other agencies, we identified ten issues which were significant enough to be examined in detail given the nature of the proposed action. In this section, we describe the environmental effects associated with these ten issues.

Issue One

This issue addresses the impacts that harvest and the transportation system could have on the productivity and function of the freshwater system. This issue deals directly with effects to the Freshwater Influence Zone described in Chapter 3. Direct and indirect effects to the important elements and processes in this zone are described.

Riparian Ecosystem

Impacts to wildlife in the Freshwater Influence Zone (FIZ) relate to changes in fish production and vegetation. Tom and Frank Creeks are the most important fish producing streams. Reductions in fish production could reduce the availability of this important seasonal food source for bears, eagles and otters. Thus, alternatives which impact fish productivity could also impact these wildlife species (see discussion on aquatic system below).

Buffers along Class I and II streams protect the most important riparian vegetation.

In all alternatives except D the Freshwater Influence Zone would have the least number of acres harvested of the zones that receive harvest (Table *4-1*). Most of these acres harvested in all alternatives are along class 3 streams. Required TTRA buffers along class 1 and 2 streams should protect the most important vegetation components of the riparian system for bears, eagles, otters, and Vancouver Canada geese. The TLMPS DEIS states that there is believed to be a relationship between the amount of timber harvested in old growth and a reduction in Vancouver Canada goose nesting and brood rearing habitat capability. Harlequin ducks may also nest in this zone. However, the most likely nesting areas are farther upstream along Tom and Campbell Creeks where harvest will not occur.

Table 4-1, Estimated Acres Harvested By Zone

Zones	A	B	D	E	F	G
FIZ	0	41	83	183	91	66
Upland Saltwater Facing	0	221	393	609	489	310
Upland Interior	0	121	14	215	121	121
Total	0	383	490	1007	701	497

Alt. E has the most and Alt. D the least effect on bear corridors other than Alt A.

Riparian areas connect the different zones and provide travel corridors for wildlife within the study area. Bears and other wildlife use Tom and Frank Creeks and the muskegs that parallel them as travel corridors. All proposed roads would parallel these corridors and therefore impact their use by wildlife. Schoen and Beier (1990) reported a correlation between brown bear kill and cumulative length of road construction. Roads provide improved access and disturbance resulting in more legal and illegal hunting and defense of life and property kills. Alternative E, by roading in both drainages would have the most impacts. The road along Tom Creek would be particularly detrimental because of its location near a heavily used trail connecting the Tom Creek and Harding River drainages. Alternatives B, F, E and G all propose a road along Frank Creek and would have similar impacts to this watersheds' use by bears. Alternative D would create the least impact with no roads. In order to protect bears, we would close all roads to motorized traffic. This would reduce but not eliminate impacts to bears and other species using these corridors because roads would still improve access for foot travelers.

All Alts. have minimal effects on floodplains.

The Executive Order 11988, dealing with floodplain management, was largely intended to reduce the risk of property loss, minimize the impact of floods on human safety, health and welfare; and to restore and preserve the beneficial values served by floodplains. None of the proposed alternatives would result in human occupancy of floodplains. Because the proposed action would have no floodplain development other than stream crossings and some timber harvest, there will be no anticipated loss of property values, nor will human health, safety, or welfare be adversely affected. In general, road location, construction measures, drainage structures, and timber harvest are expected to have only minimal effects on the natural or beneficial values of the floodplains.

Aquatic Ecosystem

The exact impacts of timber harvest and related road building on water quantity and quality are part of complex relationships with diverse watershed features. However, the following indicators allow for reasonable predictions of the adverse risk to a watershed, stream and water quality:

1. The length of stream channels near harvest units (within about 100 feet) that have banks and/or sideslopes which are sensitive or susceptible to damage.

2. The number, length and type of roads built, and the number of stream crossings required.

3. The proportion of area harvested in a watershed, with consideration given to its overall "sensitivity" based on factors including soil erodibility, stream stability, and drainage density.

4. Mitigation measures applied, including Best Management Practices (BMPs), Forest Plan guidelines, and site specific prescriptions.

Alt E poses the greatest risk to water quality.

Length of Affected Stream Channels- Risk of water quality degradation increases with the amount of near-stream harvest. The risk is greater where both sides of a channel are affected. Buffers, when implemented to protect sensitive banks and riparian areas, reduce this risk considerably. However, streams are at risk to increased sedimentation if the buffer blows down. Table 4-2 summarizes stream lengths that would be potentially impacted by harvesting units near streams in a given alternative. Data are expressed in terms of the management concerns mentioned in Chapter 3; **sideslope stability** (V-notches and areas where streambank composition minimizes bank stability concerns) and **streambank stability** (alluvial channels and similar areas where most but not all buffer strips may be implemented). Data are also differentiated by whether harvest units would occur on one or both sides of a channel. In terms of overall affected stream length, streams would be subjected to the greatest risk by alternative E, where 7.1 miles of stream would be be within about 100 feet of a harvest unit. Following, in decreasing order, alternatives F (5.5 miles), D (4.3 miles), B (3.5 miles) and A (0 miles) would have less impacts. The actual streamside harvest is difficult to predict under Alternative G due to the random nature of group selection harvest. Impacts are expected to be intermediate to Alternative F and B.

Table 4-2, Length of Stream in or near Proposed Harvest Units

Management Concern	Length of Streams Near Units (Miles)				
With harvest units on:	ALT A	ALT B	ALT D	ALT E	ALT F&G
STREAM BANKS					
One side of stream	0	1.0	0.7	1.0	1.0
Both sides of stream	0	1.1	0.1	0.4	0.1
Subtotals:	0 (0%)	1.1 (4%)	0.8 (3%)	1.4 (6%)	1.1 (4%)
SIDE SLOPES (including V-notches)					
One side of stream	0	0.5	0.5	1.2	0.8
Both sides of stream	0	1.9	2.9	4.5	3.6
Subtotals:	0 (0%)	2.4 (3%)	3.4 (5%)	5.7 (8%)	4.4 (6%)
OVERALL (stream banks plus side slopes)					
One side of stream	0	1.5	1.3	2.2	1.8
Both sides of stream	0	2.0	3.0	4.9	3.7
Totals:	0 (0%)	3.5 (3%)	4.3 (4%)	7.1 (7%)	5.5 (5%)

Alt. E has the most stream crossings, Alt A and D none.

Stream Crossings- Other factors being equal, the greater the total road length, the higher the risk of water quality degradation. Alternative E would require the most construction of roads (4.6 miles), and 12 stream crossings. Alternatives B,F and G with 1.3 miles of road and 5 stream crossings. Alternative D and Alternative A have no stream crossings. Most of the roads proposed for construction lie on stable landforms away from streams. Differences in the risk to water quality among alternatives is considered minimal since the roads are planned primarily to access routes to helicopter landings and are not located on high-risk terrain.

Cumulative Effects on Water Quality- The cumulative effect of harvest units and roads on streams includes the additive effect of stream lengths and crossings from all proposed, existing and foreseeable actions. The Campbell study area is somewhat unique in that there are no existing roads or units in the project area and there are no further roads planned in the future other than those pictured in Alternative E. It is unlikely that there will be harvest exceeding that pictured in Alternative E through the first fifty years of the harvest rotation. The Campbell study area is also the only VCU scheduled for timber harvest on the north side of the Bradfield Canal.

Cumulative effects on water quality will be less than risk of this entry.

We would also close all roads under all alternatives, remove drainage structures, construct water bars across the road, and revegetate disturbed areas. Natural reclamation by alder (Alnus spp.) is also likely and will help reduce sediment movement away from the road prism. Consequently, the risk of cumulative long term effects is considered less than the risk of initial, short term effects associated with construction and hauling.

Cumulative Proportion of Area Harvested by Watershed Sensitivity- McCorison, et. al. (1988) developed a model to determine relative sensitivities of watersheds in Southeast Alaska. These sensitivities were used in conjunction with beneficial use indices to estimate watershed harvest thresholds of concern. Harvest near or over the threshold indicates increased risk of water quality degradation. Factors considered in this model include drainage densities, average channel stabilities of various channel types, erodibility of the various soils encountered, and an index of beneficial use values.

This model first assigns to each watershed one of four corresponding sensitivity classes. Then the model considers the beneficial uses of the various streams and the sensitivity of their respective watersheds before assigning each watershed a recommended maximum harvest area. This percentage of the total watershed area is referred to as a watershed's threshold of concern (TOC).

Cumulative harvest levels are well below the threshold of concern.

When run on the watersheds in the Campbell study area, the results indicated that most would contain cumulative harvest levels well below their threshold of concern. Examples are found in Table 4-3. Watersheds are referred to by their Alaska Fish & Game Catalog number and can be referenced using Figure 3-4 in Chapter 3.

Table 4-3. Examples of Watershed Thresholds of Concern and Harvest Percentages.

Watershed/ Stream	TOC	Alt A	Alt B	Alt D	Alt E	Alt F	AltG
Tom Creek (All Watersheds)	20%	0 %	0 %	<1 %	1 %	0 %	0%
Frank Creek	60%	0 %	9 %	1 %	9 %	9 %	9%
Watershed A24A #107-40-10350	40%	0 %	0 %	2 %	2 %	2 %	<1%
Watershed A29A #BC-10	50%	0 %	0 %	4 %	4 %	0 %	0%
Watershed A28A #107-40-10450	40%	0 %	20%	20%	20%	20%	20%

Specific BMP's we will follow are referenced in Appendix A and Table 4-4.

Mitigation Measures- Aquatic Habitat Management Unit (AHMU; see Chapter 3, Fisheries) guidelines will be followed and regional Best Management Practices (BMPs) implemented. Site specific implementation of the BMP's has been referenced on the unit and road cards and in Table 4-4 below. These measures will minimize the short term effects on runoff processes and sediment production and transport. Such measures include site specific use of vegetated streamside buffer strips, full or partial suspension of logs when yarding across streams (inherent with helicopter yarding), "splitlined" harvest settings (streambanks used as boundaries), and minimizing small woody debris "loading" in stream channels.

Fish Habitat- As discussed in Chapter 3, salmon habitats are products of the geology and soils, topography, vegetation, climate, and hydrology of a watershed. Changes in these conditions can bring about changes in habitats which, in turn, can greatly affect fish production. Land use activities can amplify natural events by removing some of the natural buffering mechanisms which are part of natural processes.

Studies have shown that natural environmental conditions can cause unmanipulated fish populations to vary as much as fifty percent from year to year. Specific cause-and-effect relationships between management activities and populations are clouded by changes in the environment. Some impacts can be masked while others can be compounded.

In spite of the complexity of cause-and-effect relationships involved in fluctuations of salmon populations, certain land management practices are known to increase the risk of impairing habitats. BMPs have been jointly developed by the *A*laska *D*epartment of *E*nvironmental *C*onservation (ADEC) and the Forest Service in response to the requirements of the Clean Water Act. Table 4-4 summarizes the relationship between the desired future condition of elements of fish habitat, risk factors, and BMPs associated with those risk factors and desired conditions. Streamside buffers, drainage structures, and timing windows are the primary practices used to avoid impacts to fish habitat.

100 foot or greater buffers will protect fish habitat and floodplains.

Streamside Buffers- We would protect Class I fish streams and their Class II tributaries with a 100-ft. minimum no-harvest streamside buffer as required by the Tongass Timber Reform Act (TTRA). Where sensitive hydric soils, such as alluvial fans and floodplains, occur past the 100-ft. minimum, we would extend the buffer to include these areas in order to protect the floodplain.

Stream Crossings- We would install drainage structures such as culverts which fit the streamflow and fish habitat conditions to protect water quality and fish habitat. We would also observe timing windows for installation to further protect water quality and fish habitat from sediment during critical periods.

Alt E would have the greatest risk to fish habitat.

Figure 4-1 provides a summary comparison of relative risk to fish habitat posed by implementation of the action alternatives. Alternative E would present the greatest potential to impact fish habitat because it would harvest the most acreage adjacent streams, yard the most timber volume by both helicopter and ground-lead cable systems, and construct the most road involving the greatest number of stream crossings.

Alt A and D would have the least risk to fish habitat.

Alternative D would present the least risk to fish habitat because it would construct no road, would require no stream crossings by road, would harvest the least overall acreage adjacent to streams, and would not include any ground-lead cable yarding. Alternatives B, F, and G would be intermediate between Alternatives E and D, and would be virtually equal in potential for impact with Alternative F harvesting slightly more helicopter volume than B or G.

Table 4-4. Summary of Relationship of BMP's to Desired Conditions and Potential Impact

Desired Condition	Undesired Condition	Potential Impact	Impact Mechanism	Prevention Practices	Associated BMP's
barrier-free access	isolated,unutilized habitat	passage blocked	perched culvert; plugged culvert; excessive velocity dewatered channel; slash, road fill	structure installation structure maintenance timing window; streamside buffer	13.16 14.15 thru 14.16 14.17 thru 14.19 12.6 thru 13.3
stable spawning gravels, natural pool-riffle ratio	displacement of egg/sac fry; filling of pools	destablization of streambed	removal of large wood	streamside buffer; restrict instream operations	12.6 thru 13.8 13.16 thru 14.13 14.14 thru 14.16
clean spawning gravels	embedded spawning gravels	siltation of spawning gravels	erosion of roads exposed soils	erosion and sediment prevention and control	13.1 thru 13.14 13.16 14.1 thru 14.25
healthy eggs and sac-fry	unnecessary egg and sac-fry mortality	mechanical injury	equipment in streams	timing windown	14.6 thru 14.10 14.14 thru 14.16
stable alluvial fans and floodplains with narrow, deep channels energy concentrated	unstable alluvial soils with broad & shallow or braided channels; energy dispersed	destabilization of streambanks; loss of soil productivity	removal of large wood and thin organic layer	reparian area buffer; streamside buffer; full suspension yarding; streambank and channel protection	12.6 thru 13.3 13.8 thru 13.19 13.9 12.7 thru 13.16 14.2 thru 14.15 14.17 thru 14.18
adequate cover from predators, high flows	reduction or lack of cover, refuge	loss or displacement of fish	removal or displacement of large wood; damaged stream-banks	streamside buffer; restrict use of equipment in stream; full suspension yarding	12.6 thru 12.7 13.1 thru 13.2 13.3 thru 13.16 14.14 13.9

Table 4-4. Summary of Relationship of BMP's to Desired Conditions and Potential Impact (continued)

Desired Condition	Undesired Condition	Potential Impact	Impact Mechanism	Prevention Practices	Associated BMP's
optimal water temperatures	oxygen-related fish kills	elevated stream temperatures; increased oxygen demand	removal of shade decomposition of in-stream slash	streamside buffer removal of introduced slash	12.6 thru 13.3 13.16
nutrient sources for primary, secondary biological production	loss of productivity	reduced populations	interruption of nutrient cycles; loss of inputs	streamside buffer streambank protection	12.6 thru 12.7 13.3 thru 13.16

Figure 4-1, Comparative Figure of Relative Risk to Fish Habitat

Comparison	Alt.	Relative Risk
Equivalent Clearcut Harvest Acres (x10) H=Helicopter C-Cable	Alt. A	
	Alt. B	HHHHHHHHHHHHHHHHHHH
	Alt. D	HHHHHHHHH
	Alt. E	HHHHHHHHHHHHHHHHHHHHHHHHHHHH CCCCCCC
	Alt. F	HHHHHHHHHHHHHHHHHHHHH
	Alt. G	HHHHHHHHHHHHHHHHHHHH
Number of Stream Crossings	Alt. A	
	Alt. B	XXXXX
	Alt. D	
	Alt. E	XXXXXXXXXXXX
	Alt. F	XXXXX
	Alt. G	XXXXX
Road Miles	Alt. A	
	Alt. B	RRRRRRR
	Alt. D	
	Alt. E	RRRRRRRRRRRRRRRRRRRRRRRRR
	Alt. F	RRRRRRR
	Alt. G	RRRRRRR
Length of Buffered (B) and Unbuffered (U) Streams in AHMU Class I Watersheds (x1000 ft.)	Alt. A	
	Alt. B	BBBBBBBBBB UUUUUUU
	Alt. D	BBBBBBB UUUUUU
	Alt. E	BBBBBBBBBBBBBBBB UUUUUUUUUU
	Alt. F	BBBBBBBBBBBB UUUUUUUU
	Alt. G	BBBBBBBBBBBB UUUUUUUU

Figure 4-1 bar charts illustrate the relative differences in risk levels to the fishery. Alternative A would have no additional effects, therefore no letters are shown. Each letter in the first chart represents an equivalent number of clearcut acres. For comparison purposes only, each harvest acre was "converted" into a clearcut. For example, 1 acre of Overstory Removal represents <1 acre of clearcut depending on the diameter limit proposed. Letters representing the number of stream crossings, feet of road and feet of buffered and unbuffered streams in Class 1 watersheds are also shown.

Increased taking of fish could occur as an indirect result of harvest.

Human Influence on Fish Populations- Although not usually associated with habitat capability, fish stocks themselves are part of the structure and functional processes of the freshwater influence zone. Reduction in escapement by interception can reduce stream productivity over time due to the loss of fish carcasses (nutrients) in the aquatic and riparian systems. Continued reduction in escapement can also result in low use numbers, making the local population more vulnerable to extinction by an environmental event. Although fishing is not regulated by the Forest Service, the various alternatives would have potential for adverse impacts resulting from increased fishing opportunities.

Patterns of human use of fish resources in the study area would change with implementation of any of the action alternatives just from the short-term but intensive occupation of the area before and during logging. Levels of risk associated with interception through fishing are governed by the timing and duration of activities and the size of the human population associated with the harvest activity. Recovery to pre-harvest conditions depends upon the level of fishing, harvest re-entry frequency, and the environmental conditions following the end of harvest activity.

Increased fishing could compound Alt E effects to fish populations.

Indicators of relative risk to fish escapement presented by human occupation with this initial entry include sale size and total miles of road. These two indicators best reflect the amount of risk to fish populations from fishing pressure. These two indicators are factored into Table 4-1. Again, Alternative E would present the greatest risk because it would entail harvesting the greatest volume from the greatest area, and involve the most road construction. There is the greatest intensity or duration of human occupation of the study area. Alternative D would pose the least risk to fish escapement and associated nutrient levels because it would harvest less volume and would require no road construction, reducing time needed to complete initial entry and potential access. Alternatives B, F, and G would be intermediate to Alternatives E and D.

Wetlands Ecosystem

Standard protection for wetlands includes prudent road location and drainage structure installation. We would apply BMP's to protect the water storage and nutrient cycling functions of these areas.

Alts E and G affect the greatest amount of forested wetlands.

Since a large amount (about 30 percent) of the study area is classified as wetlands, they are not considered a scarce resource. Values associated with these wetlands vary greatly depending on the type of wetland, proximity to water bodies, landscape position, etc. Alternatives were designed to minimize potential impacts to identified high value areas rather than to avoid development on all areas classified as wetland.

The potential impact to wetlands is indicated by the amount of forested wetlands proposed for harvest (Table 4-5), and the amount of specified road proposed to be built on areas classified as wetland (Table 4-6). Alternative E would harvest the greatest amount of forested wetlands, followed by Alternative G and Alternatives B and F.

Table 4-5, Harvest of Forested Wetlands.

	No Action	Alt B	Alt D	Alt E	Alt F	Alt G
Acres	0	6	0	33	6	26

The wetland vegetation, soil drainage or hydric character of a wetland will not be measurably altered by road construction except for the width of the roadfill itself. This is normally about 24 feet wide and amounts to approximately 2.9 acres per mile. Alternative D has no road construction. Alternatives B, F and G impact less wetlands with roads than Alternative E.

Table 4-6, Specified Road on Wetlands

Roads on Wetlands	No Action	Alt B	Alt D	Alt E	Alt F	Alt G
Miles of Road	0	.9	0	3.0	.9	.9
Acres Covered	0	2.6	0	8.7	2.6	2.6

Issue Two

This issue concerns the effects of the transportation system on the productivity and function of the beach habitats. This issue is directly tied to the Saltwater Influence Zone described in Chapter 3.

Alternatives B and D propose only one LTF.

There is no timber harvest planned under any alternative for the Saltwater Influence Zone (SIZ) except for that which is needed to operate the transfer facility. Thus, the only habitat alteration would be associated with LTF's, rock pits and roads. Alternative A would have no effect on beach areas. Alternatives D and B with one LTF each would have the least impacts. Alternative B would have greater impacts than Alternative D because the beach area adjacent to Frank Creek estuary has more value to wildlife than the beach area on the west face. Alternatives F and G with 2 LTF's would be intermediate and alternative E with 3 LTF's would have the most impact.

LTF's were selected with the least effects on the SIZ.

In evaluating sites for LTF's and roads, several wildlife and fisheries considerations were taken into account. We avoided locations with eagle nest trees and avoided the mouths of streams and estuaries as much as possible. LTF's would be rehabilitated after the sale which could provide additional meadow areas for early spring foraging by wildlife. LTF sites should be replanted with native species. Sort yards were located in the uplands except at the West Face site. We placed beach fringe roads in the forest to minimize disturbance to sedge meadows because this habitat type has high value and limited acreage in the study area. Clearing widths for roads and flight corridors (West LTF Site only) will be minimized.

Higher volume Alts will have the longest and most extensive human presence.

Human presence and activities such as helicopter yarding and boat traffic will disturb species that use the immediate beach fringe area such as otters, bears, bald eagles, geese and migratory waterfowl and shorebirds. If an action alternative is selected, restrictions on timing and location of helicopter yarding and blasting near eagle nest trees will follow the Interagency Agreement between the Forest Service and Fish and Wildlife Service for bald eagle habitat management. Specifically, we would not allow repeated helicopter flights within 1/4 mile of active nests and no blasting within 1/2 mile of active nests without written concurrence of the Fish and Wildlife Service. Repeated boating activities within 1/4 of a mile of active nests would also be minimized. Timing restrictions at the most heavily used areas (eg, Tom Creek estuary) during the most critical time periods (eg, early spring) may also be needed. Regardless of these mitigation measures some displacement of wildlife during harvest activities would occur.

Assuming a relationship between the total harvest and the intensity/duration of activities and the location of this disturbance adjacent to LTF sites, Alternative E would have the greatest impacts to wildlife and their use of beach areas, followed by F and G. Alternative B and D would cause the least amount of displacement of the action alternatives. Alternative A would cause no displacement.

Issue Three

This issue concerns the effects of different methods and locations of log entry on marine fish and shellfish productivity. This issue describes the effects to the Marine Zone described in Chapter 3.

The Marine Zone has the potential to be impacted by log handling and storage as well as floating camp facilities. Log handling is comprised of four phases: 1) dumping; 2) booming/rafting; 3) storage; and 4) transport. The potential for impact by these operations is discussed by the three areas of the zone (intertidal, subtidal, and offshore) described in Chapter 3, Affected Environment. Although other agencies have jurisdiction over permitting such activities in this zone, discussion here focuses on the relative risk to the marine environment presented by the range of action alternatives.

Analysis revealed that, due to the combination of natural conditions governing stand suitability, terrain accessibility and environmental constraints, a total of three possible LTFs will be required to accommodate the range of action alternatives. The locations of these facilities are depicted in the alternative maps in Chapter 2. The West Face Site may not be needed if the operator elects to use a barge to drop logs on. This option would have less impacts to the marine ecosystem. However, in order to display the most potential impacts that could occur, we assumed that all the action alternatives except B would require the use of the West Site.

The best LTF site is not located near the best timber harvest opportunities.

Siting of the log transfer and raft storage facilities is the single most important means of controlling adverse impacts to the Marine Zone. Table 4-7 provides a summary comparison of how well each log transfer/rafting facility meets siting guidelines developed by the Alaska Timber Task Force. These guidelines are included in the Best Management Practice which addresses location and design of LTF's. Most risk of environmental impact is associated with the intertidal areas and the subtidal areas (subtidal areas lie between intertidal and offshore areas).

Intertidal and Subtidal Areas

Ramps, the primary component of the potential LTFs, would extend from above the high tide line down through the intertidal area to the lowest low tide mark. Although only conceptual designs have been made, shot rock ramps would be constructed. This material would cover the existing intertidal areas and would create a different, simpler habitat due to its grain size, composition, and slope. To marine life, this modified habitat would more resemble a fractured rock outcrop in the middle of a cobble, sand, and gravel beach.

Of three LTF's, the west site has intermediate effects on marine areas.

West Site. This site could dewater and water up to 11 million board feet under Alternative D, 7.1 MMBF in Alternative F and E and almost 3 MMBF under Alternative G. This site is the only LTF with a 2 1/2 acre sort yard associated with it. This site would be located on an alluvial fan bordered by a Class I stream (107-40-10390) flowing along the toe of the slope on the eastern side of the fan. The site is located on the westerly edge of an intensively used commercial shellfishing area that is deemed to be a moderately productive area. This site may be required in order to implement all the action alternatives except Alternative B. It would be intermediate between the Middle site and the East site in terms of risk to biological productivity and displacement of commercial shellfishing operations.

The Frank LTF has the most effects but is located in the best site possible.

Frank Creek. This site would water approximately 8.8 million board feet of timber under all action alternatives except Alternative D. This site would require a road for a short distance along the beach from a proposed rock quarry site adjacent a Class I stream (BC-9) to the west. The intertidal zone is the most extensive of the three sites and is associated with a productive subtidal area used for commercial shellfishing. The site is associated with a small island which is connected to shore by an intertidal area. To move the site to the west would impact the small estuary of the Class I fish stream. To relocate the site further to the east would increase impacts associated with commercial shellfishing. The potential for adverse impacts are reduced to the greatest extent practicable by siting this LTF near the island. This site would be required in order to implement Alternatives B, E, F, and G, but not Alternative D. Of the three sites, this site would present the greatest risk to biological productivity and would create the most displacement of commercial shellfishing operations.

The Tom Creek site best fits the Timber Task Force recommendations.

Tom Creek. This site would water approximately 6.5 million board feet under Alternative E only. This site would be adjacent a Class II stream (BC-12). The intertidal zone is short, steep, comprised of coarse substrate, and abruptly drops to depth. This site is deemed to be the least productive of the LTF sites. This site would be needed for implementation of only Alternative E. Of the three sites, it would pose the least potential for adverse impact on commercial shellfishing operations and biological productivity.

Table 4-7, Summary Comparison of LTF Sites and Siting Guidelines

Siting Guidelines	West Site LTF	Frank Cr.LTF	Tom Cr.LTF
Greater than 300 ft. from mouths of Class I fish streams or important fish spawning and rearing areas.	No	Yes	Yes
5-acre minimum of weather-protected waters	No	No	No
Proximity to minimum 5 acres of relatively flat uplands.	Yes	Yes	Yes
Safe road gradient from uplands facilities.	Yes	Yes	Yes
Adjacent strong tidal currents.	Yes	Yes	Yes

Table 4-7, Summary Comparison of LTF Sites and Siting Guidelines (continued)

Siting Guidelines	West Site LTF	Frank Cr.LTF	Tom Cr.LTF
Away from productive intertidal and subtidal zones.	No	No	Yes
Away from shallow, productive habitats (extensive tideflats, salt marshes, kelp/eelgrass beds, seaweed harvest areas, shellfish concentration areas)	No	No	Yes
Safe marine access to facilities for tugboats	Yes	Yes	Yes
Minimum depth of 40 feet or deeper measured at Mean Lower Low Water	No	No	Yes
330-feet minimum distance away from eagle nest trees.	Yes	Yes	Yes
Avoid small craft boat anchorages and use areas.	No	No	Yes
Minimize effects of earthquakes	No	No	Yes

Alternative A would have no risk to the commercial fishery or the productivity of the Marine Zone. Alternative D would have the least effects of all action alternatives since it avoids the Frank Creek site and only requires the West Site. Alternative B would have the next greatest impact to productivity. Alternatives F and G have greater impacts than D and B because they require two LTF's including the Frank Creek site. However, both these alternatives handle less volume at the West Site than Alternative D. Alternative E would have the most impacts to marine productivity but it is not expected to be that much more than Alternative F since the Tom Creek LTF site best meets the ATTF guidelines.

Offshore Zone

Potential impacts to the offshore zone would include reduction in light penetration for photosynthesis under the rafts and minor chemical pollution associated with motorized vessels. These risks would likely vary little among the log transfer and rafting sites and are difficult to quantify except by the volume of material dropped or rafted by alternative. Size and amount of material rafted would be directly proportional to the volume harvested with each Alternative. While rafts would block direct sunlight, they would provide temporary cover for some fish species.

There are two options to harvest the West Face; development of LTF or use of barges.

A potential operator would have two options for harvesting the area along the West Face under Alternatives D, E, F and G. Alternative B does not harvest the West Face. Operators could construct the West Face LTF and drop logs directly into saltwater rafts, tow them to the LTF, take them to the sort yard, remove the remaining limbs water and raft them again so that tugboats can take them to a scale yard. The second option is to drop logs directly into the water or on to a barge and use the barges as the platform for limbing and chipping. Logs could then be taken to the scale yard by barge or by rafting the logs again and using tugboats.

Direct water drops would increase debris and traffic in the Canal; Alt D would have the most impact.

Direct dropping of logs into the saltwater by helicopter would occur in offshore areas. Deep areas would be chosen for drops so that logs would not become embedded in the bottom and debris would disperse with the current. More logs could be potentially dropped into saltwater under Alternative D and less with Alternative G. Alternatives F and E would have almost the same volume of logs for direct water drops. Alternative B would and A would have no water drops. This operation could increase the amount of debris floating in the canal which could present some hazards to small boats.

If barges are used there may be three to five traveling to and from the site.

The amount of barge traffic would increase under the second option. Although impacts to the intertidal and beach areas would be less, traffic and debris in the off-shore areas would increase if an operator chose to use barges as sortyard areas as opposed to constructing the West LTF Site. Using barges to harvest the West Face could require approximately three to five barges in the canal operating intermittently. Again Alternative D, has the most volume of logs and would require the most barges and time to harvest the area (11 MMBF). Alternative G would require less barges and they would not be needed as long (3 MMBF). Alternatives E and F would harvest the same amount off the West Face and require the same time (7.1 MMBF). Alternatives A and B would not require any barges be used.

Two to three tugs may also be needed.

The number of tugs used would likely remain constant under all action alternatives unless an operator chose to use barges to haul logs to the scale yard. We estimate that two or three tugs may be required to transport logs intermittently. The duration of occupancy of the area would vary among alternatives and would be proportional to the volume harvested.

Issue Four

This issue addresses the effects of harvest on species conservation and biodiversity.

Management Indicator Species (MIS)

A note about Habitat Capability Models- Habitat Capability Models utilize research results and best professional judgement of biologists from different agencies (USFS, ADF&G, USFWS) to relate characteristics of the vegetation (habitat) on a site to that site's capability to support a population of animals. These models are simple and cannot include all relationships that affect the number of animals that actually exist on that land. Therefore, they cannot be and are not meant to be an estimate of actual wildlife numbers. Their intended use is as a guide to predict relative impacts associated with management activities.

In addition to habitat disturbance through harvest, roads associated with development activities allow improved access for hunters and trappers. This is of greatest concern for bears and furbearers. This concern is discussed with respect to brown bears in issue 6. The same mitigations for brown bear should also protect furbearers to the maximum extent possible.

Alternative E has the greatest effects on all species, Alts A, B have the least effects.

Table *4-8* shows the percentage of original habitat capability and rank of potential impact by alternative for brown bear, deer, goat, hairy woodpecker and marten. Alternative E has the greatest impact to all species. Considering all MIS, the alternatives ordered by increasing impact are A, B, D, G, F, and E.

Table 4-8, Percent Habitat Capability & Rank of Impacts to MIS by Alternative

Species	Alternative	% of original Habitat Capability	Ranks*
Brown Bear	A	100	1
	B	98	3
	D	99	2
	E	96	6
	F	97	5
	G	98	3
Deer	A	100	1
	B	96	2
	D	95	3
	E	92	6
	F	94	5
	G	95	3
Goat	A	100	1
	B	97	2
	D	95	3
	E	91	5
	F	91	5
	G	95	3
Hairy Woodpecker	A	100	1
	B	95	2
	D	94	3
	E	89	6
	F	92	5
	G	94	3
Marten	A	100	1
	B	95	2
	D	95	2
	E	91	6
	F	93	5
	G	95	2

*Rank: 1=least impact 6=most impact

Threatened, Endangered & Sensitive Species

Harvest activities on this sale should not cause any impacts to currently listed threatened or endangered species (Arctic and American perigrine falcons, humpback whales and Stellars sea lions). Neither are there any expected effects on Forest Service sensitive species (trumpeter swans, Peale's peregrine falcon, osprey).

Alts. A and B pose the least threat to potential goshawk or murrelet nests.

The most likely potential for effects would be loss of nesting habitat for goshawks and marbled murrelets. There are no known nests for either species but goshawks could potentially nest and murrelets are likely to nest in the study area. If a goshawk nest is found in the study area, the "Interim Habitat Management Recommendations for the Northern Goshawk: Tongass National Forest 1992" will be implemented. These recommendations include establishing a 20-30 acre buffer around the nest where vegetation manipulation is not allowed. A copy of the recommendations is available from the Stikine Area Supervisor's office and is contained in the planning file. If a marbled murrelet nest is found a 30 acre buffer surrounding the nest is recommended. Ranking the alternatives in order of increasing potential for impact to murrelets and goshawks, based on the amount of old growth acres harvested, would be A, B, G, D, F, E. Alternatives D and G have similar acres harvested but it is assumed that using group selection harvest in alternative G would better preserve the integrity of the old growth forest structure.

Retention, Fragmentation and Patch Size

To help mitigate effects on wildlife, a system of retaining harvestable old-growth for wildlife habitat was developed under the Forest Plan. Table 4-9 shows the percentage of harvestable acres which needed to be retained for each category. Acres of habitat for each category can overlap. For example, the 81 acres of habitat needed for landbirds can overlap with the 155 acres needed for landbirds if the habitat requirements are the same or similar. Under this project we designated an average of 950 acres of harvestable old-growth to provide additional habitat for old growth dependent species. A majority of these acres were placed within the Saltwater Influence Zone since this zone has the highest overall habitat values.

About 950 acres of additional harvestable old-growth was designated to be retained under all alternatives.

Areas of forest excluded from harvest for legal or economic reasons are not used to determine retention acreage, i.e., TTRA buffers, high hazard soils and the uneconomical stands in the upper watersheds. Beach and estuary buffers are included because under the present TLMP they are available for harvest. The TLMP Revision does not include provisions for designating old-growth acres by project. Therefore the acres retained are for this planning period only, but our recommendations will show future planners the options, management strategies and areas important to wildlife considered by our team. General strategies for placement of retention acres are presented in Chapter 2 and are shown in Alternative maps in Chapter 2.

Table 4-9, Old Growth Management Acreages as Directed by Tongass Land Management Plan

Code	Original Acres	% To Retain	Acres to Retain
41 - bear-beach	621	5%	31
42 - bear-estuary	285	25%	71
43 - bear-riparian	393	20%	79

Table 4-9, Old Growth Management Acreages as Directed by Tongass Land Management Plan (continued)

Code	Original Acres	% To Retain	Acres to Retain
45 - deer-high elevation	1205	5%	60
46 - deer-low elevation	1899	5%	95
48 - goats	1628	5%	81
49 - furbearer-upland	2111	5%	106
50 - furbearer-beach/riparian	993	10%	99
51 - landbird	3104	5%	155
56 - eagle nests-low density	380	15%	57
58 - eagle nests-high density	122	100%	122
Total	3104	NA	956

Alts A, B and G fragment existing old growth areas the least.

All alternatives place the majority of old growth management acres in the Saltwater Influence Zone. This is consistent with direction for current TLMP retention and the TLMP Revision standards and guidelines for beach fringe and estuarine management. Alternative B retains other acres on the West Face which is best for goat and deer winter range and causes the least fragmentation. Alternative G would be similar to B in effects on fragmentation assuming that the group selection units are small enough to be functionally similar to natural forest openings. Alternative D is intermediate in maintaining goat winter range and causing fragmentation by retaining goat habitat and old growth forest in Frank Creek. Alternatives F and G concentrate old growth habitat acres in Tom Creek which should benefit bears, geese, eagles and waterfowl. Alternative E maximizes fragmentation, disperses retention acres and has the most impact to species conservation values.

Table *4-10* indicates the maximum and minimum changes that would occur in the size, acreage and perimeter of old growth blocks. Figure *4-2* illustrates what would happen under alternative E, which represents the maximum effect. Units 7 and 8 on the West Face would split the large block connecting the Marten Creek and the study area. Alternative B is the only action alternative that would not split the block. The relatively small increases in perimeter is due to most of the units east of Frank Creek occurring on the edge of the forest blocks. Thus taking "bites" out of the edges rather than creating "holes" in the forest interior.

FIG. 4-2, MAXIMUM HARVEST EFFECTS ON OLD GROWTH BLOCKS

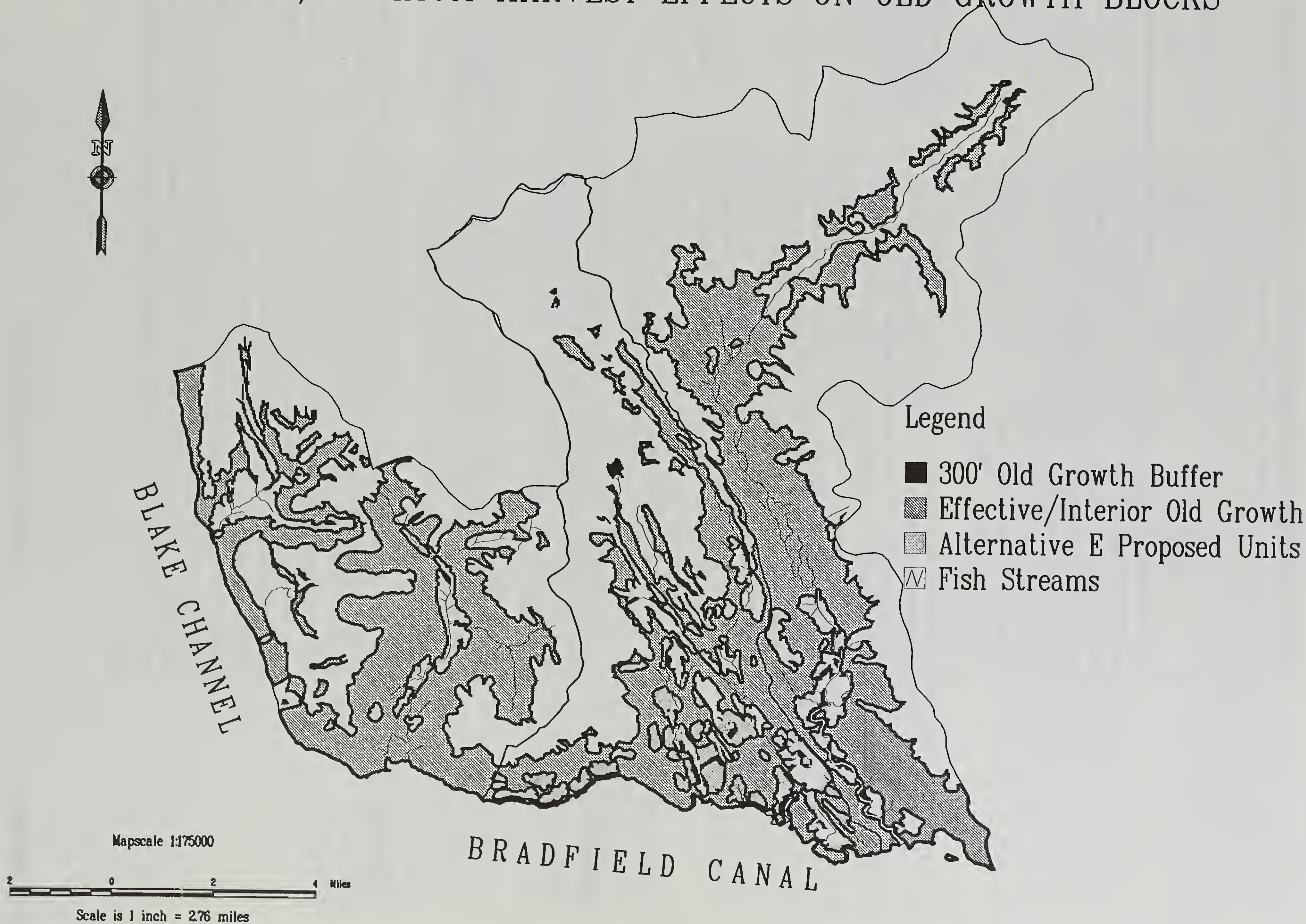


Table 4-10, Effects of Fragmentation on Interior Old Growth Forest

Measure	Original Condition Alt A	Minimum effect Alt B	Maximum effect Alt E
#blocks >1000 acres	2	2	3
acres in blocks >1000 acres	24,556	23,763	22,540
% of original condition	100	97	92
miles of perimeter in blocks >1000 acres	201	201	202
#blocks < 1000 acres	54	56	62
acres in blocks < 1000 acres	4,346	4,375	4,416
% of original condition	100	101	102
miles of perimeter of blocks < 1000 acres	108	110	116
total interior acres	28,902	28,138	26,814
% of original condition	100	97	93

Corridors

Because there will be no harvest in the saltwater influence zone, travel corridors along the beach fringe will be maintained in all alternatives. Vertical corridors are maintained by leaving uncut strips within areas of concentrated units, ie., low elevation on the West Face (units 3-7), east side of Frank Creek (units 15-19), and Tom Creek units 27 and 28. Alternatives B and G best maintain the integrity of the corridor on the West Face connecting the study area and the Marten Creek drainage. The road associated with harvesting in Tom Creek (alternative E) would impact the corridor between the Harding River and Tom Creek drainages.

Vegetation Structural Diversity

In all alternatives the use of diameter limit harvests and helicopter logging systems should leave more structural diversity in the remaining stand than typical cable system clearcuts (See illustrations in Figure 4-5 through 4-9, later in this chapter). In many units, additional small clumps of trees will be left, centered on large snags or cull trees, to maintain snag and down wood components (See unit cards, Appendix A). It is recommended that all cull trees be left standing where the safety of operations permit. Leaving snags and "defective" green trees is intended to reduce impacts to species that use cavities, such as hairy woodpeckers, marten and others. The use of group selection cuts in alternative G should more closely mimic small scale natural disturbances, thus maintaining horizontal structural diversity. Alternative E harvests the most acres and has the most clearcuts so would reduce old growth habitats the most.

Cumulative Effects

By the end of the harvest rotation up to 16% of the forest in the study area may be in managed stands (based upon the total number of acres which are suitable and accessible). Units under Alternative E most closely resemble possible managed stands. The habitat value of the managed stands will vary through time as the forest regenerates and matures, but may never regain their highest value as old growth forest.

Alaska Department of Fish & Game (ADF&G) Wildlife Analysis Area (WAA) 1812 includes VCU's 509, 510, 511 and part of 505. VCU's 509 (Marten Creek) and 511 (Harding River) are currently in LUD II designations which precludes management for timber production as does the TLMP Revision preferred alternative. Part of VCU 505 may be included in the Blake timber sale scheduled for 1998. The amount of timber harvest that would occur in the portion of the VCU included within WAA 1812 is unknown at this time.

A large part of the Bradfield will likely remain in a natural condition.

The Bradfield Canal area also includes WAA's 1813 (Bradfield River), and 1814 (Hoya and Canal Creeks). A 25 MMbf timber sale is tentatively scheduled for Canal and Hoya Creeks in 1996. Approximately 170 MMbf of timber were harvested in the Bradfield River during the 1960's and 1970's. Also within these WAA's are the Anan Creek, Eagle River, Tyee Creek and White River drainages which are in Land use designations which do not manage timber. Thus, a significant portion of the Bradfield Canal will be managed in a natural condition. The proximity of undisturbed VCU's to sale areas should conserve sufficient habitat to maintain viable populations in the Bradfield Canal area even under current harvest plans. These natural areas are particularly important for species that need large areas to maintain viable populations such as bears, eagles, and goshawks.

The TLMP SDEIS (Appendix L) lists possible changes in habitat capability for MIS in these WAA's compared to 1954 levels. Brown bears, goats and Vancouver Canada geese are expected to maintain at least 90% of original habitat capability through the end of the 5th decade (approximately 2040) in all 3 WAA's. Other MIS are more heavily impacted by past activities in WAA 1813 but only hairy woodpecker habitat capability is expected to decrease below 90% for WAA's 1812 (87%) and 1814 (84%).

More human access may be the greater threat to wildlife in the Bradfield over time.

The State of Alaska maintains road corridor rights of way within the study area for a road connecting Wrangell to the mainland road system in Canada. Full analysis of the potential impacts of that project are beyond the scope of this document. However, the improved access and increased number of visitors would likely have significant impacts on wildlife resources. Increased human access and harvest of wildlife species poses a much greater threat to wildlife populations over time in the Bradfield than the currently planned habitat manipulations due to timber harvest.

Issue Five

This issue addresses the effects of harvest on goat winter range, disturbance of kidding and rearing areas, travel corridors.

Alternatives A, B and G have the fewest effects on goat habitat.

The most valuable goat habitat occurs in the saltwater-facing uplands, where the majority of harvest also occurs under most alternatives. The most potential impacts occur on the West Face. Table 4-11 shows the number of acres of high, medium and low value goat habitat harvested for the VCU and the WAA. The study area contains 26% of the high value goat winter range in the WAA and virtually all of the high value habitat that occurs next to salt water (Figure 4-3). Under Alternatives E and F 15% and 4% of the high value goat habitat would be harvested in the VCU and WAA respectively. Of the action alternatives B would have the least impact by only harvesting 2% and 0.5% of high value habitat. The alternatives listed in order of increasing impact are A, B, G & D, and F & E (Table 4-8). Harvest of high HSI value habitat in the east of Frank Creek drainage is not considered as great an impact as harvest on the West Face because it is separated from an alpine ridge by Frank and Tom Creeks. The units with the most impact would be #1,#2 and the east part of #4. These units are relatively level sites above cliffs where goats rest and feed because they have a good view of the surrounding area and have close access to cliffs for escape from predators (C. Smith, ADF&G).

FIG. 4-3, GOAT WINTER RANGE IN THE WAA

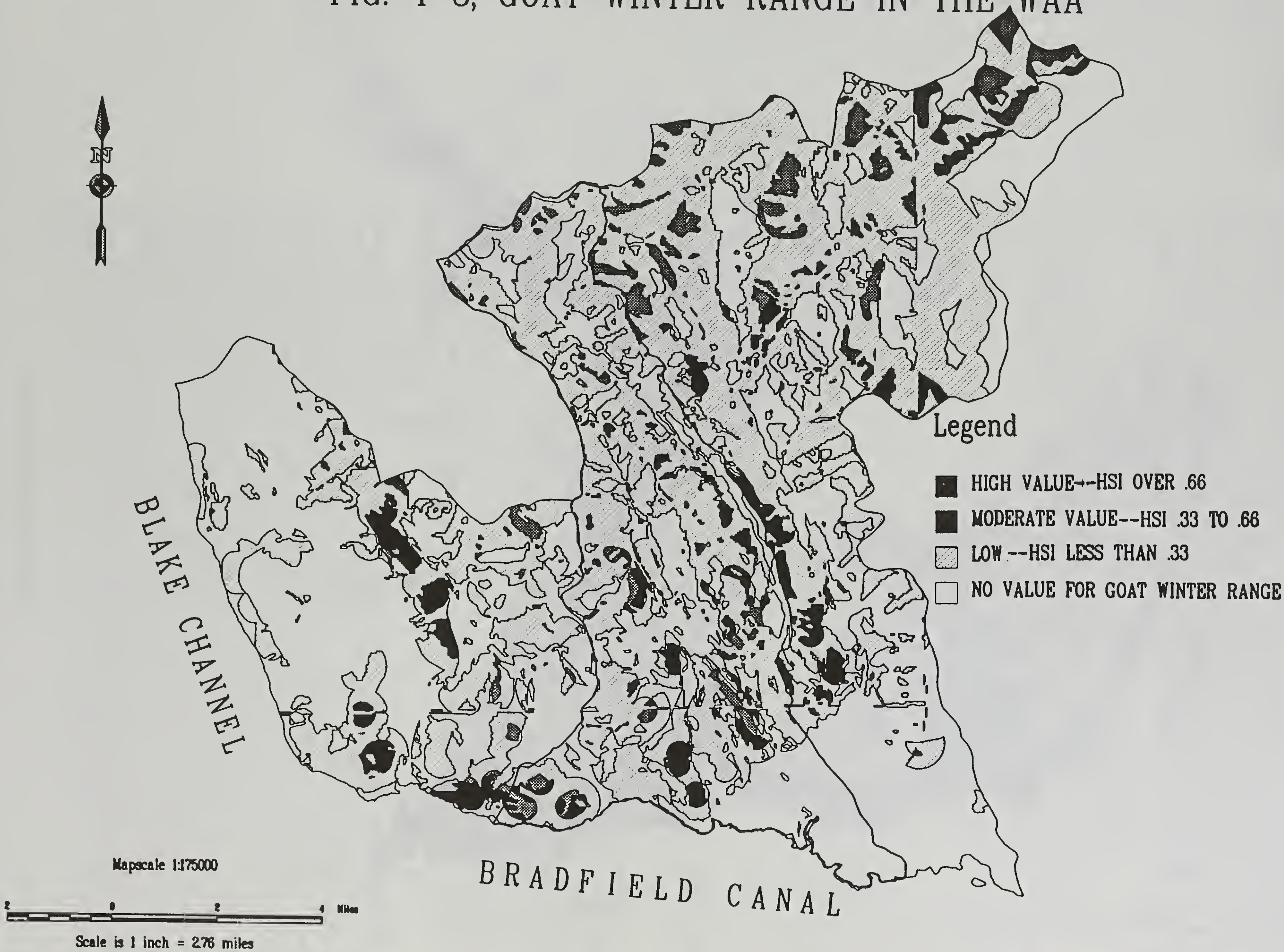
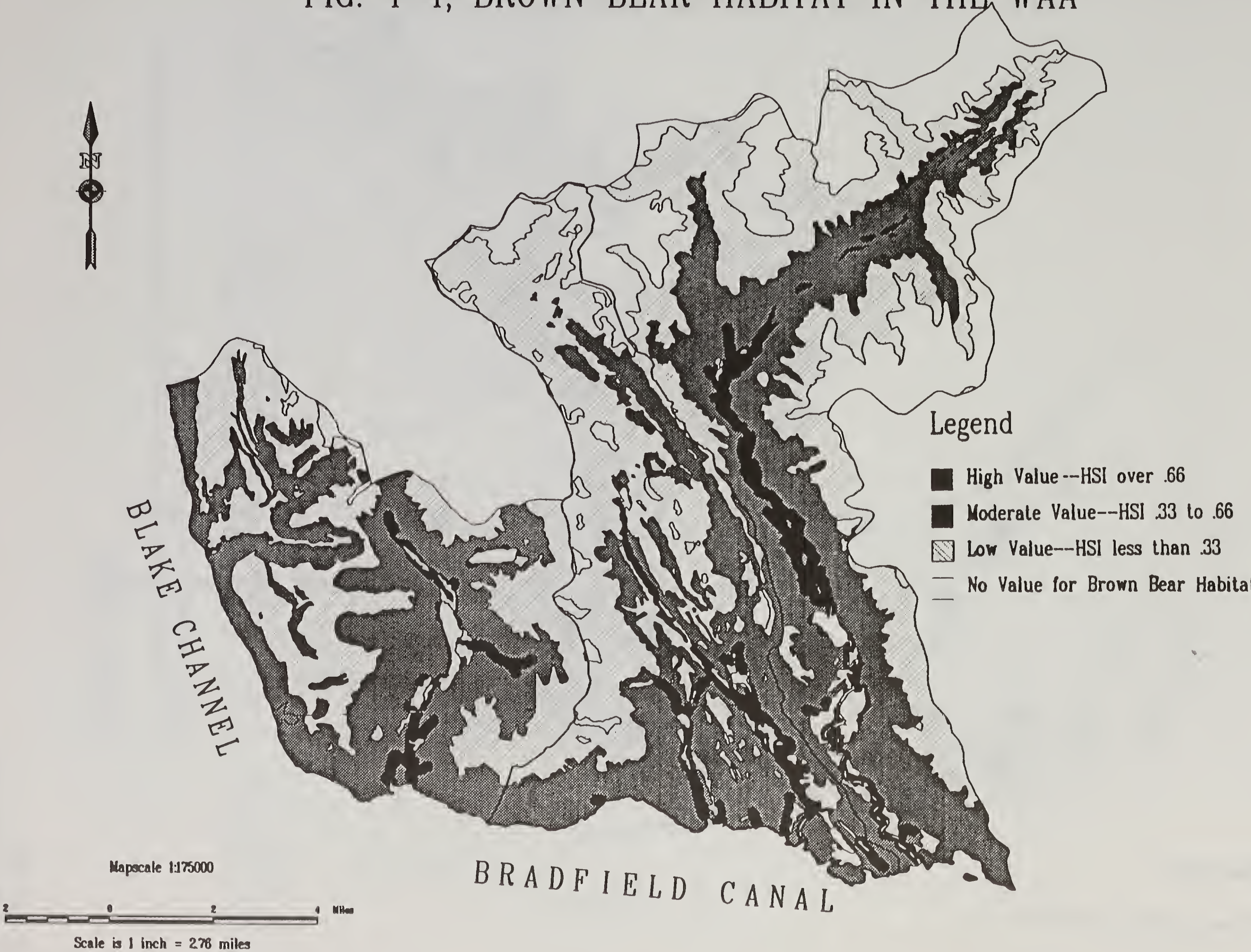


FIG. 4-4, BROWN BEAR HABITAT IN THE WAA



Timing restrictions and helicopter guidelines are used to minimize effects.

Mitigations for harvesting near goat habitat follow proposed TLMP Revision standards and guidelines for timing restrictions. They include maintaining a 1000 foot vertical or horizontal clearance of helicopters from visible mountain goats at all times; no use of helicopters at the West Face LTF from January 1 to March 31; and avoid helicopter yarding of units 1,2,4,8 and 13 during winter and kidding seasons, January 1 - June 30. Additional measures could be taken by the Forest Supervisor to drop units #1 and #2 and possibly the east part of unit #4 to protect goat habitat.

Table 4-11, Harvest Acres in Goat Habitat

Habitat Value	Alternative Acres Harvested						Total Acres In:	
	A	B	D	E	F	G	VCU	WAA
High	0	19	145	164	164	59	1,092	4,199
Medium	0	0	4	4	4	1	566	4,810
Low	0	292	204	557	436	354	8,852	46,783
Zero	0	72	137	282	97	83	17,190	43,749

Issue Six

This issue addresses the impacts of harvest and roads on brown bear habitat and potential increases in hunter harvest both during and after logging.

On Chichagof Island bears avoided clearcuts (Schoen and Beier 1990). Recent clearcuts produce abundant berries but protective cover is lacking and slash makes travel hard. older second growth forests have little value due to the lack of forage. Table 4-12 shows the amount of bear habitat harvested in the VCU and WAA. The study area contains 27% of the high value bear habitat for the WAA (Figure 4-4). Under Alternative E 8% of the habitat in the VCU and 2% of the high value habitat in the WAA would be harvested. Alternative D would harvest the least at 5% (VCU) and 1% (WAA). Table 4-8 shows the reduction in habitat capability and rank of each alternative for impacts to brown bears.

The greatest impacts to bears come from better access created by roads.

The greatest impacts to bears are associated with human access which results in increased disturbance, hunting mortality (legal and illegal), and defense of life and property kills. Schoen and Beier (1990) reported a correlation between cumulative length of road built and fall brown bear kill. Table 4-13 shows the density of accessible travel routes (roads, saltwater and navigable streams) in the study area. The lower Tom and Frank Creek values were obtained by calculating the area of the watersheds upstream to the farthest access (eg, Tom Lake, refer also to Figure 3-4). Adjacent watersheds analysis areas used the entire area of each watershed that would likely be accessed by each access type. Alternative E would have the greatest impact because of roading in both drainages. Alternatives B, F, and G would be intermediate and Alternatives A and D would not have roads. The road in Tom Creek would likely have a greater impact than the road in Frank Creek because of its proximity to the corridor between the Tom Creek and Harding River drainages (see discussion for Issue 1).

The Tom Creek Road would have a greater impact than the Frank Creek Road.

The influx of people associated with timber harvest would likely increase the hunting pressure in the area. In a typical operation of this size approximately 30 - 35 people at one time could be involved for 1-2 years. Species such as brown bear which cannot sustain high hunting pressure may be heavily impacted by such an influx. Potential measures to mitigate these impacts could include closing the bear season in this area during timber harvest operations (requires coordination with ADF&G). Alternatively, the Forest Service could require that company transportation not be available for use by employees (Forest Service and contractors included) for hunting access to the area, similar to what was done at the Greens Creek Mine on Admiralty Island. However, the Forest Service cannot restrict employees use of personal equipment for hunting after work hours. Therefore this second potential mitigation measure may not meet the objective of reducing hunting pressure during the contract period.

Table 4-12, Harvest Acres in Brown Bear Habitat

Habitat Value	Alternative Acres Harvested						Total Acres in:	
	A	B	D	E	F	G	VCU	WAA
High	0	61	46	122	61	55	1,389	5,062
Medium	0	321	444	883	639	442	9,871	39,909
Low	0	1	0	2	1	1	14,481	39,486
Zero	0	0	0	0	0	0	1,959	15,084

Table 4-13, Human Travel Corridor Density

Area	mi^2 Accessed	Road Length (mi)	Stream/ Shore Length	Density w/o road (mi/mi^2)	Density w/road (mi/mi^2)
Lower Tom Cr	5.9	3.3	4.1/4.9	1.5	2.1
Tom & adjacent watersheds	31.5	3.3	4.1/4.9	0.3	0.4
Lower Frank Cr	1.6	1.3	0/0.7	0.4	1.3
Frank & adjacent watersheds	5.5	1.3	0/0.7	0.1	0.4
Entire VCU	43.3	4.6	4.1/12.2	0.4	0.5

Issue Seven

This issue addresses the effect of harvest proposals on soil productivity resulting vegetative composition and structure over time.

Soil Productivity

Management practices designed to protect the long-term productivity of the soil have been applied to all alternatives. All alternatives are expected to meet or exceed Soil Quality Standards (FSH 2509.18 Soil Management Handbook R10 Supplement 9/90), and therefore, have no measurable adverse effect on the long-term productivity of the soil.

BMP's, helicopter yarding and small leave trees decrease risk of soil disturbance.

There would be little risk of detrimental soil disturbance in units that are yarded by helicopter. Full suspension of logs (both ends of the log suspended above the ground) by helicopter is designated where needed to prevent mass movement or surface erosion. In addition, units that contain steep, high hazard soils have harvest prescriptions that leave all trees less that 12 or 16 inches in diameter to retain much of the rooting strength contributing to the stability of the soil.

Alternative G would likely result in little or no immediate soil disturbance because all yarding will be done by helicopter, however it is has the most risk of post-harvest damage to soils resulting from blowdown in units designated for group selection harvest.

Only Alternative E contains harvest units to be yarded by cable systems. On these units, partial suspension of logs (lead end of log suspended above the ground) is recommended on all cable yarding settings. This is primarily to prevent displacement of the nutrient rich surface soil layers. Units designated for cable yarding in Alternative E do not contain areas of high hazard soils.

Roaded alternatives would take more lands out of production.

Alternatives B,E,F, and G build road in Frank's creek watershed, Alternative E builds road in both Frank's and Tom's creek. This would have the effect of taking some land out of production. These roads are designed to maintain the natural drainage pattern to prevent detrimental changes in soil drainage. Length and width of temporary spur roads are to be kept to a minimum to reduce the amount of forest land taken out of production. All disturbed area of bare mineral soil will be revegetated by application of the prescribed grass seed and fertilizer during the next growing season.

Soil Erosion

The relative risk of excessive soil erosion from timber harvest can be rated in terms of the amount of timber harvest and road construction on hazardous soil types. Soil hazard classes rank the probability of soil erosion, in the form of mass movement, resulting from logging or road building activities. The probability is related to a number of factors such as soil strength, soil wetness, and slope. In general soils in the low hazard class are found on relatively gentle slopes. They are stable in the natural setting and have little probability of soil movement if disturbed. Moderate hazard soils are generally found on about 35 to 75 percent slopes. They are usually stable in the natural setting but the probability of movement increases if they are disturbed. The soils in the high hazard class are typically found on slopes of 65 to 75 percent and greater. They often show signs of soil instability in a natural setting and are extremely prone to soil movement if disturbed by road building or harvest practices.

We will implement special practices when harvesting on high hazard areas.

Table 4-14 shows the area of land in each hazard class that would be harvested in each alternative. This data is derived by comparing the proposed harvest units to the Soil Resource Inventory in the GIS. Areas proposed for harvest on high hazard soils in Table 4-2, have special practices prescribed to minimize increasing the instability of the soil. These practices include full suspension yarding by helicopter and limiting harvest to tree diameters exceeding 12 or 16 inches breast height to maintain root strength. Some units, on steep broken slopes such as unit #10,19, and 24 have been designated for patch-cut harvest. Harvest patches will be located on areas of moderate slopes avoiding areas of excessively steep slopes.

Table 4-14. Acres Harvested in Each Soil Hazard Class

Soil Hazard Class	No Action	Alt B	Alt D	Alt E	Alt F	Alt G
Low	0	3	17	86	13	13
Moderate	0	340	453	869	648	444
High	0	40	20	52	40	40
Total	0	383	490	1007	701	497

Road building impacts are related to the length of road constructed and the soil hazard class in which each segment is built. Table 4-15 shows the miles of road within areas of a predominant hazard class. Often, benches within high or medium hazard areas are used for road location which can reduce the overall impact of road construction. Alternative E would pose the greatest risk to soil erosion.

Table 4-15. Miles of Specified Road Proposed in each Soil Hazard Class.

Soil Hazard Class	Alt A	Alt B	Alt D	Alt E	Alt F	Alt G
Low	0	1.0	0	3.2	1.0	1.0
Moderate	0	.3	0	1.1	.3	.3
High	0	0	0	.3	0	0
Total	0	1.3	0	4.6	1.3	1.3

Vegetative Structure

The harvest of timber would have the immediate effect of reducing the amount of vertical structure in the stand. Vertical structure can be defined as the different heights and layers of trees, shrubs and forbs. Typically in an old growth stand the trees vary in height from under an inch to over 180 feet tall. Data from from this study area shows spruce trees over 200 feet tall and hemlock trees over 170 feet. Generally the more trees removed in an area the greater the loss of structure. Within 5 years after harvest numerous small trees will be growing.

Harvest methods should leave multi-storied, multi-aged stands over time.

This sale has alternatives which rely on harvest of trees over a certain diameter limit. Trees smaller than 12-16 inches would not be harvested under this method (see Unit Cards, Appendix A). In addition, most units leave some scattered, larger trees for increased diversity. Figures 4-5 thru 4-9 illustrate the structure and composition which should be left with the overstory removal harvest method. These sketches show relative changes in vertical structure under different diameter limit cuts. The heights shown are from trees measured in the study area. Greater diversity should result in the stand over time as some of the leave trees and newly established trees grow. The only uncertainty with this method is predicting the number of trees left after harvest and the percentage of these trees that will continue to grow of "release" due to increased light.

Figure 4-5, 9" Diameter with Cable Yarding

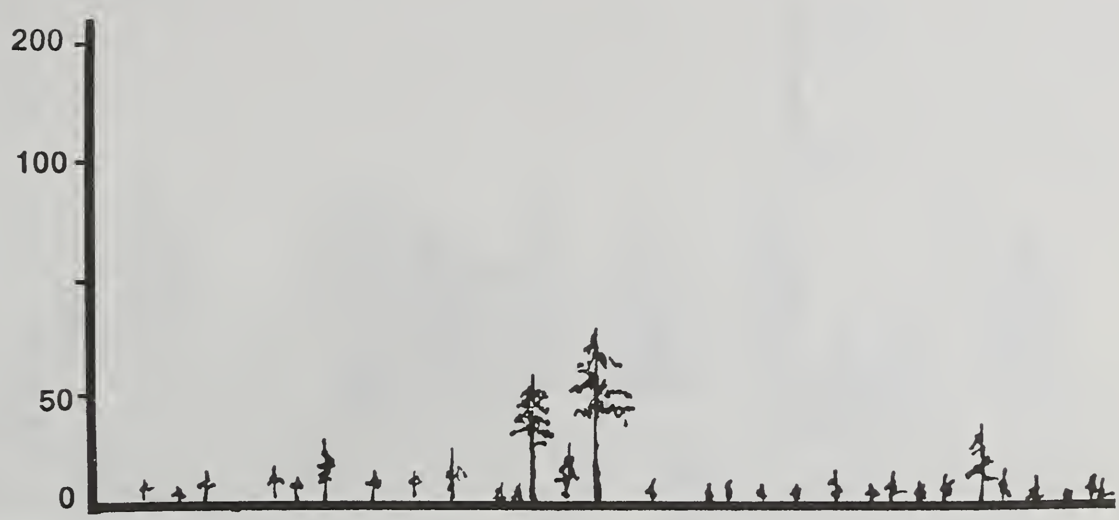


Figure 4-5 shows the most common example of harvest in southeast Alaska. Few trees are left standing except between settings of the cable. Most trees left are below a 1 foot.

Figure 4-6, 12" Overstory Removal with Helicopter

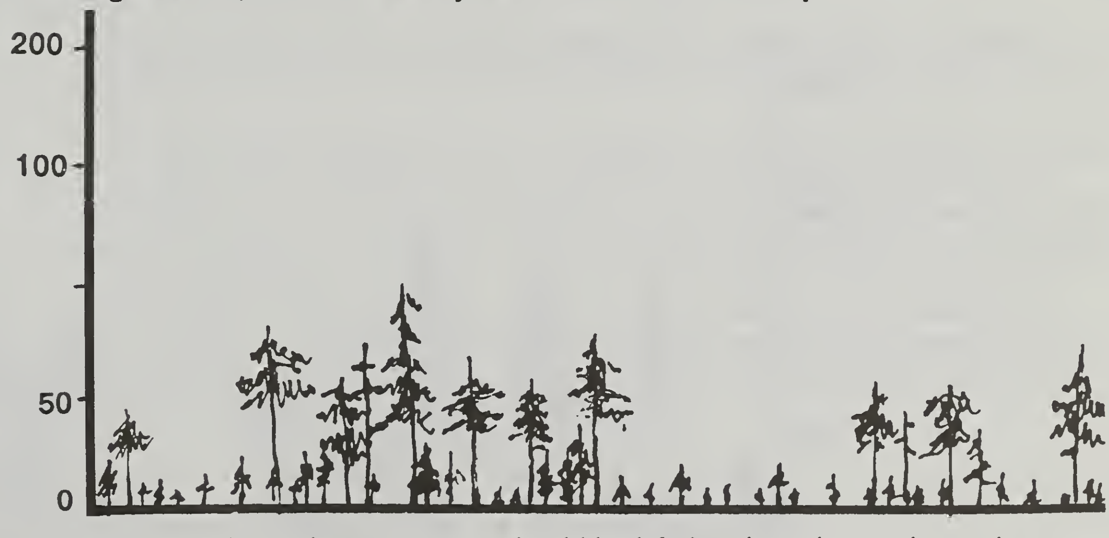


Figure 4-6 shows that more trees should be left than in a clearcut by cutting trees larger than 12" and yarding with a helicopter. Some will be damaged when felling larger trees since the majority of trees are still removed leaving an estimated <1/4 of the original trees.

Figure 4-7, 16" Overstory Removal with Helicopter

Figure 4-7, illustrates that an estimated 1/4 to 1/3 of the original trees should remain after harvest by only cutting trees larger than 16" in diameter. Trees remaining would also be taller.

Figure 4-8, 16" Overstory Removal with Leave Trees and Helicopter

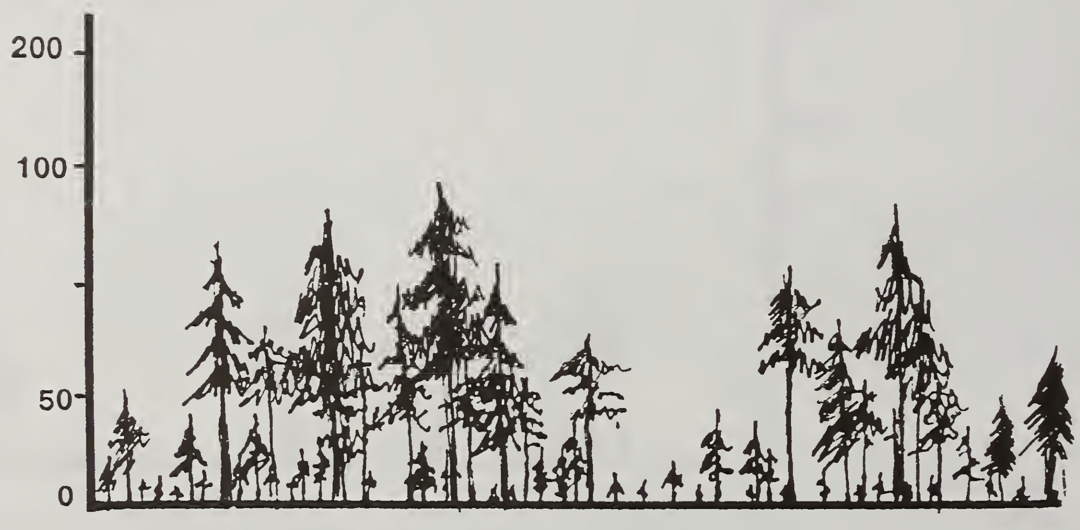


Figure 4-8, shows that in addition to the trees left in 4-7 several large trees could be left to add more diversity to the stand over time.

Figure 4-9, Old-Growth Structure

For comparison, Figure 4-9 illustrates the original multi-storied and multi-aged old growth forest.

Issue Eight

This issue addresses the effects of the alternatives on social values, the cultural resources and the setting for established human uses in and around the study area.

Human Habitats

The human habitat concept was used in Chapter 3 to illustrate a synthesis of all the social components of the study area landscape. We use this concept again to summarize the effects of each alternative on the overall social environment. Alternative E poses the greatest overall change to the existing human habitats and use patterns while alternatives B and G pose the least amount of overall change. Alternatives D and F pose intermediate levels of change and make tradeoffs in different areas. Alternative D avoids changes to the stream valleys and retains existing access patterns, while Alternative F changes the West face and Frank Creek areas but retains the existing condition in Tom Creek.

Summary of Effects on Human Habitats

Alternative	Area, Change	Effects Description
Alt. A	All, unchanged	All past and present areas would remain unchanged as described in Chapter 3.
Alt. B	Frank Creek; visually modified, interior access	Impacts the fewest number of existing habitats; hike-in access into the Frank Creek watershed would be improved; visitors seeking easier access into interior and are tolerant of a modified appearing area will be favored by 1 1/2 miles of increased access; views from the Bradfield Canal would be partially retained and impact the smallest % of the viewshed; short term decrease in use of area for 1-2 years during logging but this decrease would be the least in duration and extent of action alts.; increase in ability of land to produce wood products lowest but retains the most future harvest flexibility.
Alt. D	All; visual change, no change in access	No increase in interior access to watersheds thereby retaining existing human access pattern; next to greatest affects on seen area from the Bradfield; visual quality is partially retained to very modified depending on success of harvest method; interior settings of Frank Creek is least affected of all alts.; Tom Creek interior setting somewhat affected in subparts F & G; potential goat hunting opportu-nities may be impacted by decrease in habitat acres; west face LTF visible for 2-3 years; short-term decrease in use of area for 1-2 years during logging; ranks third in the ability of VCU to produce wood products but may foreclose on future economically viable offering in Frank and Tom Creeks.

Summary of Effects on Human Habitats (continued)

Alternative	Area, Change	Effects Description
Alt. E	All & Harding R.; visual & access	Introduces the most change to the study area as primitive landscapes are converted to roaded natural (Tom) or roaded modified (Frank); hike-in access is increased in both Tom and Frank Creek and the Harding River; hunting and fishing will increase in Tom Frank and Harding as a result of increased access and use; user looking for easier access in semi-natural or modified landscapes will have increased opportunities; views from Bradfield will be most affected; visual quality is partially retained or very modified depending on success of partial harvest method; decrease in use of area for 1-2 years during logging and is the most extensive area affected and duration; has the highest timber production rate with no or few future entries for rotation.
Alt. F	West Face, Frank Creek; visual & access	Combines the effects of Alt. B and D, except no change to any of the Tom Creek viewshed; retains existing look and access pattern in Tom Creek watershed; views along Bradfield are affected near west face and Frank Creek; second highest timber production rate but may foreclose on possibility of an economically viable entry into Tom Creek in the future.
Alt. G	West Face, Frank Creek; visual & access	Same areas are affected as Alt. F but impacts to human habitats more closely resemble Alt. B; only subareas C, D and E will have noticeable change since group selection harvest methods are used on west face; impacts to habitats same as Alt. B with the addition of the west face LTF which will appear modified for 2-3 years; although third highest acres are harvested, has fourth highest timber production rank since group selection technique results in slower growth rate than other methods.

Cultural Resources

Cultural resources within the study area may contain significant information on past environmental conditions and human lifeways, possibly including information related to past conditions along the north Pacific Rim. Cultural resources are both fragile and non-renewable. Primary impacts can include alteration to the settings of sites; alteration of above ground objects, features and structures, as well as the spatial relationships among them; and disturbance or destruction of subsurface cultural deposits. Secondary impacts may include a higher frequency of site looting and vandalism due to increased access from project development.

The beach and estuary buffers minimize possible impacts.

It is well documented that sea levels in the islands of southeast Alaska fluctuated throughout time. It is also apparent that the coastal environment was the focus of most activities of the people who have inhabited the area. Therefore it appears as though past sea levels play an indicator role in locating most cultural resources and the key criterion for establishing probability zones is elevation above the present coastline. Our implementation of 500 foot beach fringe and 1,000 foot estuary buffer zones with this project effectively minimizes the possibility of impacting cultural resources eligible for the National Register of Historic Places under all alternatives.

All known cultural sites will be protected.

All of the known study area sites will be avoided and a minimum 300 foot protective buffer will be established around each site. All point specific impacts anticipated below 100 feet in elevation have been or will be surveyed prior to development. A report summarizing the 1992 field survey results will be submitted to the Alaska State Historic Preservation Officer. The report includes recommendations for additional survey which will be completed prior to a record of decision (ROD). Specifically, recommendations call for cultural resource clearance for all of the log transfer facilities and most of the roads and timber harvest units. There are only five timber harvest units with portions which extend into the high probability zone. Depending on which alternative is selected road construction within the high probability zone varies from none to approximately 0.5 miles. Timber harvest units and roads located within the high probability zone will be surveyed between the draft and final environmental impacts statements. Five units (units #6, 10, 26, 29 and 37) are all or in part located in the high probability zone and are recommended for additional field survey. All other units are located in the low probability zone and are recommended for clearance.

Alt E poses the greatest threat to potential cultural resources while Alt D poses the least other than Alt A.

We applied the revised probability model to each alternative to gauge the potential effect to cultural resources. Generally, those alternatives which favor more development pose a greater threat to undiscovered cultural resources. Implementation of beach fringe and estuary buffer zones has effectively lessened potential impacts to cultural resources. Minimal road construction will also lessen access and potential secondary impacts such as site looting. An examination of ground disturbing activities in relation to the cultural resource probability model indicates that Alternative E offers the greatest chance of creating ground disturbance and potentially damaging undiscovered cultural resources, followed in descending order by Alternative D, Alternative F, Alternative G and Alternative B has the least chance of impacting cultural resources. The "no action" alternative by its very nature would constitute the least threat to cultural resources.

Table 4-16, Areas Within the High Probability Zone

Alternative	Road Miles	Timber Harvest Unit	Gross Acres
B	0.25	10	24 TOTAL: 24
D	0	6 10	44 24 TOTAL: 68
E	0.50	6 10 26 29 37	44 24 10 14 16 TOTAL:108
F	0.25	6	44 TOTAL: 44
G	0.25	6	44 TOTAL: 44

Impacts from decay, natural landscape changes and development may pose a cumulative threat to the preservation of significant study area cultural resources. Future timber harvest combined with other ground disturbing activities could result in the loss of cultural resources. Increased access to cultural resource sites will be periodically monitored to determine if any natural or human-caused impacts are occurring. Previous cultural resource surveys indicate most if not all of the cultural resources are located within a short distance of the present coastline. It is impossible, however, to determine the exact number and nature of cultural resources that are threatened by future development. Maintenance of a 500 foot beach fringe and 1,000 foot estuary protective buffer zone for future development will effectively lessen the potential impact to cultural resources. Implementation of field surveys and various mitigation measures will reduce the potential loss by preserving significant sites and by providing data on those that can not be preserved.

Scenery and Recreation

The Campbell Timber Sale presents an opportunity to investigate a different type of visual landscape management. Clearcut harvest methods require that individual harvest units be carefully designed and generally become smaller as scenic concerns become stronger. After a certain period of time, the landscape becomes increasingly "patchy" in its appearance. This eventually leads to a change in the landscape character from a relatively homogeneous appearing landscape to a heteregeneous mix of "patches."

There is an opportunity to harvest more acres and not affect scenery as much, if harvest methods work.

Due to the use of helicopter and low to moderate potential for blowdown in the study area, this sale presented an opportunity to harvest whole viewsheds under a single entry and have less overall visual effect. By treating larger areas with partial cutting, the viewer only notices changes in the texture of the landscape instead of forms or "units." The larger the scale of these texture changes the better so they are as large as the southeast Alaska landscape seems to the viewer. The character of the existing landscape is also retained under this harvest method since large areas remain more homogeneous in texture and form.

This is somewhat experimental and not all landscapes have the same characteristics present in the sale area. Unit designs did account for some of this risk so that if the leave trees blew down and the result looked like a clearcut, the scenery would appear modified but still bear some resemblance to natural forms. For this reason, all alternatives have the potential to meet or exceed the inventoried Visual Quality Objectives for the area. However, different alternatives pose more risk to the visual resource. This risk is increased by the number of acres of overstory removal used in the seen area. Alternatives E, F and D pose the greatest risk; Alternatives A, B and G the least. "Success" will be defined by the number of trees left over time in the units and the achievement of the Partial Retention VQO.

Roads would not be visible from the Bradfield Canal in any alternative, though the log transfer facilities or sort-yards included in each alternative vary in their degree of impact to the visible landscape. The light-colored granitic local rock does not favor easy concealment of rock pits and shotrock pads.

Alternative E alters existing recreation settings the most since it harvests in all areas and builds roads up both Frank and Tom Creek. Alternatives A, B and D would result in the least amount of change in the existing recreation settings but favor different users. Outfitting and Guiding activities would be benefited the most by alternatives that avoid development in Tom Creek (See "human habitat" descriptions above). The Tom Creek road would increase the use of the area by recreationists overall. Persons seeking primitive experiences would be displaced by more persons who can tolerate more people and some development.

Alternative A has no effects on scenic resources and retains the existing untouched visual condition.

Alt A and B have the least effects and risk to scenic resources.

Alternative B would have the least visual change of any "action" alternative. Retention is met throughout most of the study area from the Bradfield Canal except for the LTF and the ridge at the mouth of Franks Creek which will meet the VQO of Partial Retention. As seen by potential Anan Bay visitors, there will be no effect at all. Inventoried Visual Quality Objectives (VQO's) should be exceeded since most of the the changes in the landscape will appear natural, especially 1-2 years after harvest.

Units 9, 11, 13, 18, 19, 20 and 21 will be seen from the Bradfield Canal. If the planned partial harvest method of overstory removal and patch cutting is successful, these units would meet the Visual Quality Objective of Partial Retention and the inventoried visual condition will change only slightly. These areas would be noticed by visitors but would not attract attention because they would be perceived as natural textures and openings (EVC Type II-III). However, there is some risk that overstory removal harvest may not retain the number of trees desired. If this occurs, some units would likely meet the VQO of Modification and the resulting units will attract attention (EVC Type IV). However, this action alternative has the least amount of risk associated with experimentation of this harvest method.

It appears likely that Franks Creek, a short drainage leading to no particular recreation objectives, would attract less recreation visitors compared to the wider and more interesting adjacent stream valleys of Tom Creek. This alternative avoids change in this watershed by concentrating harvest in Frank Creek (See, Human Habitat/section above). This alternative retains the existing condition of a key area of interest to most recreationists and outfitter/ guides.

Frank LTF will be natural appearing from the middleground.

Franks Creek LTF- This log transport facility would meet the VQO of Partial Retention in the middleground. The LTF ramp itself is screened from the west and southwest but would be seen from the south and southeast. The headwall in the rockpit is favorably canted to the west and slightly north which makes it inconspicuous. The road approach stays inside a thin fringe of trees on the shoreline. Since trees will be cut along the beach, tree boles will be seen which will appear somewhat unnatural (under natural conditions, boles of beach fringe trees are not normally seen). The ramp, 250 feet long at low tide, runs along a shingle and rock beach at the very head of the little cove behind the the small island. Even when seen from the southeast the textural contrast will be minimal. The ramp will be 'edge-on' to the viewer. The granitic rock's unweathered color has not been determined in the field but it is not likely it will contrast markedly with the boulders and shingle on the beach. Underlying material has good bearing strength, eliminating the need for a thick (and conspicuous) overlay of shotrock to maintain a firm surface.

Alt D poses the most change in scenery in the Canal but changes the interior landscapes the least.

Alternative D would result in more change to the views in Bradfield Canal than any alternative. Again, although predicted visual results will exceed inventoried VQO's there is some risk that experimental harvest techniques will not be successful in meeting desired results. Alternatives D and E pose the greatest risk to visual quality should the overstory removal method not leave the predicted number of trees in harvest units. This is true because most of the harvest units under Alternative D are located in the area seen from the Bradfield Canal. Using helicopters only, almost all the suitable and accessible areas will be cut to a diameter limit. A 16" diameter limit will result in removal of approximately 2/3 to 1/2 of the trees (some are expected to be damaged during felling and yarding operations).

All units except for Unit 10 will be seen from the Bradfield Canal. If the planned partial harvest method of overstory removal is successful, these units will meet the Visual Quality Objective of Partial Retention and the existing visual condition will change only slightly. These areas will be noticed by visitors but will not attract attention because they will be perceived as being natural (EVC Type II-III). However, there is some risk that overstory removal harvest will not retain the number of trees desired. If this occurs, these units will likely meet the VQO of Modification to Maximum Modification (on the west face) and the resulting units could be obvious to visitors (EVC Type IV or V). Figures 4-10 and 4-11 illustrate the view of harvest units along the west face under the "best and worst case" scenarios.

Figure 4-10, View of West Face if Partial Retention is Achieved (Alternatives D, F and E)

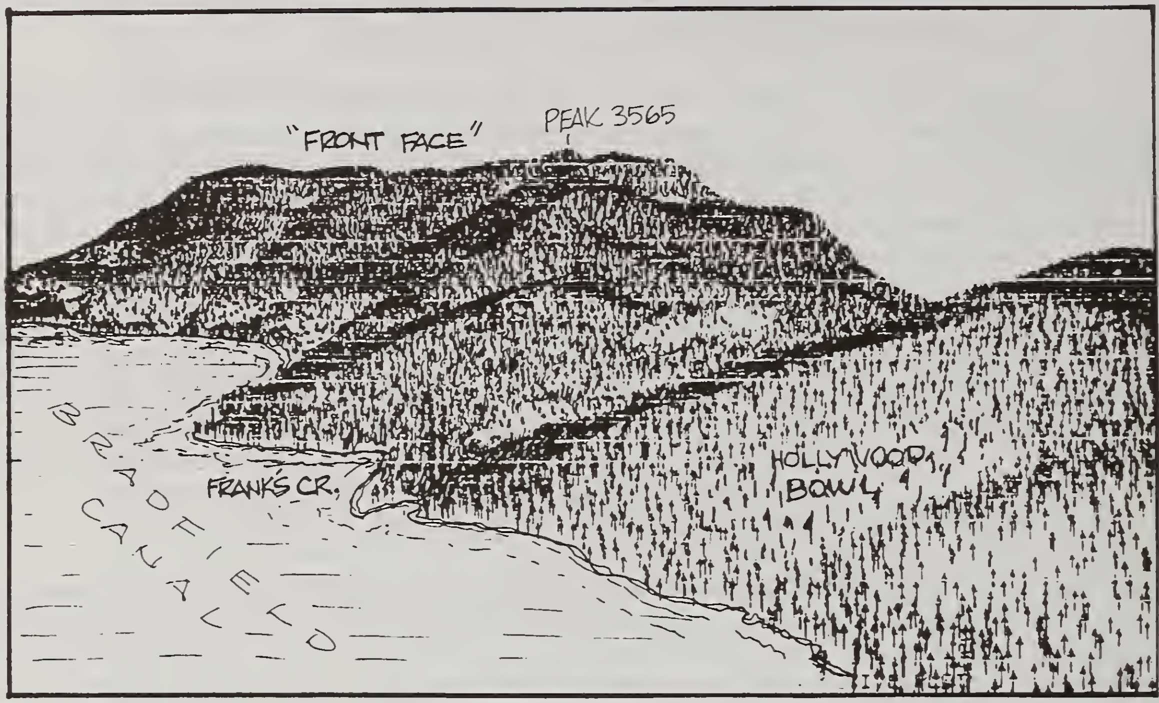
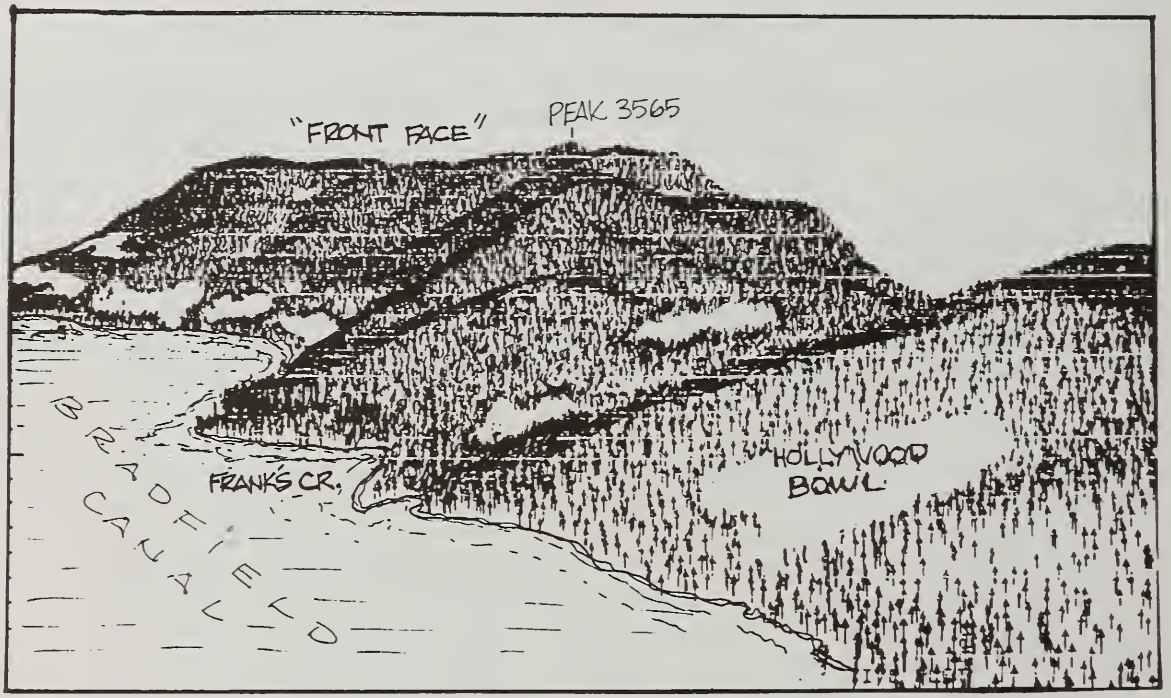


Figure 4-11, View of West Face if Modification or Maximum Mod. Results (Alternatives D, F and E)



Visitors traveling to and from Anan Bay will see little evidence of timber management since only portions of Units 1-4 will be seen from this travel route.

West face sortyard and LTF will appear obvious to travelers.

The West Face sortyard and LTF. This area would be approximately 2 1/2 acres in size. Without screening, the sort yard would meet the VQO of Modification from the middleground. The shadowy exposed boles of the trees at the upper edge of the yard would contrast strongly with the probable light color of the local rock. This contrast and effects of the sortyard are expected to last 5 years after harvest. Rehabilitation of this area with planting or seeding would soften the effects after logging.

Alternative E combines the effects and risks of Alternatives B & D and adds another LTF in the bay to the east of the Harding River. In addition, the scenic quality of the Tom Creek watershed will be affected.

The Tom LTF will appear conspicuous for a short distance along the canal.

Tom's LTF would not be seen for the first ten miles of travel up the Bradfield Canal. The ramp, however, is much more conspicuous than Franks LTF to the few who would see it on their way along the Canal to the Bradfield River/Tyee area. The steep beach will require a 200-foot diagonal ramp aimed directly south out of the little cove in which it lies. The aspect of the headwall of the nearby rockpit will be similar, but a little west of south. It does not seem possible to leave a fringe of trees for screening between the headwall of the pit and the shoreline. The rockpit headwall and ramp would be seen well enough to meet only Modification. Bradfield Inlet is only a mile wide at this point; the average viewer will see Tom's LTF from the near middleground, about a half mile away.

The Tom Creek road may result in greater recreation opportunities for some users.

The Tom Creek road would be seen by recreationists who use it to gain access to the valley of Tom Creek and the Harding River. The fairly flat terrain is interspersed with low hummocks and interrupted frequently by muskeg openings. The experience of walking on the road will be one of seeing frequent small openings, some of them natural, in the foreground. The openings would meet Modification if seen in the near middle ground. One opening will be particularly conspicuous, a cable area in the NE corner of section 20 of which about six to eight acres will be seen from the road. None of the harvest units in Tom Creek will be seen from the Harding River corridor. For some types of recreation users the Tom Creek road would be a popular access into the Tom Creek and Harding River watersheds.

Alt F has the same effects on the Canal as Alternative E but does not change the Tom Creek area.

Alternative F would have slightly less effects and risks to the visual resource as seen from the Bradfield Canal as Alternative E. However, there would be no change in the visual resource of the Tom Creek viewshed. VQO's are exceeded in most areas if harvest methods leave the predicted number of trees. If harvest methods are successful, the VQO of Partial Retention will be met. If the methods are not successful the units will be obvious and meet the VQO of Modification to Maximum Modification.

The units to be cut in Frank Creek will be seen at an angle from the Bradfield Canal. Much of the timber operations are on the West Face. Using helicopters only, the suitable and accessible areas would be cut to a diameter limit of 16" resulting in removal of 1/2 to 1/3 of the trees. The West and Frank Creek LTF's would be used.

Alt G would have the same visual effects as Alt B.

Alternative G would have visual resource impacts similar to Alternative B with the addition of the West Face LTF. The group selection harvest method along the west face would meet the VQO of Retention and would not be noticed by visitors. Harvest within Frank Creek would have the same impacts as described above under Alternative B.

Cumulative Visual Effects- Over time there is the potential for increased development and impacts to the scenic resource. Harvest activities on the other side of the canal from the study area are expected after 1996. The combined effect of this potential sale and the Canal/Hoja sale could result in a highly modified visual environment. In addition, future road proposals could add further impacts to scenery. However, if the harvest methods of overstory removal are proven effective in this landscape they could be used for future timber harvest proposals and lessen cumulative effects.

Subsistence- 810 Analysis

Section 810 of ANILCA requires a Federal agency, having jurisdiction over public lands in Alaska, to analyze the potential effects of proposed land-use activities on subsistence uses and needs. An ANILCA 810 analysis should include: an **evaluation** of the possibility of affects on subsistence uses; a distinct **finding** on whether the proposed action may significantly restrict subsistence uses; **notices and hearings** if the evaluation results in a finding that the proposed action may significantly restrict subsistence uses; and **determinations** if, following a public hearing a finding of a significant restriction remains, the responsible official decides to proceed with the proposed project.

A significant effect on subsistence resources is not expected.

Evaluation criteria used to assess the effects of the alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) supply and demand, (3) changes in access to subsistence resources, and (4) changes in competition from non-subsistence users for those resources. The evaluation determines whether subsistence uses within the analysis area or portions of the area may be significantly restricted by any of the proposed action alternatives. To determine this, the evaluation: (1) considers the availability of resources used for subsistence in the surrounding areas; (2) considers the cumulative impacts of past and foreseeable future activities on subsistence users and resources; and (3) focuses on the mapped subsistence use areas by communities with documented subsistence use within the study area.

Wildlife, fish and shellfish, marine mammals, other foods, and timber are the resources used for subsistence that are evaluated in this document. The evaluation relies heavily upon wildlife habitat capability models developed in support of the TLMP Revision and displayed in Appendices K and L of the 1991 Supplement to the Draft EIS for the Tongass Land Management Plan Revision (TLMP SDEIS).

The results of the evaluation are expressed in the findings. The findings state whether or not there "may be a significant possibility of a significant restriction" on subsistence uses. See the TLMP SDEIS (p. 3-649 & 650) for more detail on definitions of significance with respect to subsistence uses. A finding of no significant restriction completes the Section 810 requirements.

Subsistence Use Areas- Subsistence activities within the study area are concentrated in areas easily accessible from saltwater. These include the entire marine and saltwater influence zone, the majority of the saltwater-facing uplands and parts of the freshwater influence zone that dissect the other zones. The saltwater influence zone and the marine zone receive the most use. Most of the proposed timber harvest units that would affect mapped subsistence-use areas are in the saltwater-facing uplands.
Wildlife Evaluation- For this evaluation the analyses consider total effects of the timber sale on estimated habitat capability for Value Comparison Unit (VCU) 510 and ADF&G's Wildlife Analysis Areas (WAA). The WAA is the predominant analysis unit because it is the smallest unit for which data is available from ADF&G. Several assumptions are made for these evaluations for which Habitat Capability Models (HCM) are available: (1) HCM's are not intended to be population estimators. However, because we lack field based population estimates the HCM's provide a best current estimate of potential populations over time. The WAA estimates are from the TLMP SDEIS. (2) A certain percentage of the estimated habitat capability constitutes the supply available for harvest. The percentage varies by species, e.g., 10% for deer, 5% for mountain goats. (3) Historical harvest data and resource utilization gives an indication of demand. Harvest data is from various ADF&G reports. Resource utilization is supplied by various Tongass Resource Use Cooperative Survey (TRUCS) publications. (4) Demand is assumed to increase with projected population growth at 18% per decade through 2010 and 15% per decade through 2040. (5) If projected demand exceeds estimated supply a significant possibility of a restriction exists.

Abundance and Distribution of Deer- Current habitat capability represents 100% of original condition. Project analysis estimates habitat capability for the VCU at 586 deer, with a maximum reduction of 8% (alternative E) to 538 deer. The TLMP SDEIS estimates a current habitat capability of 812 deer for the WAA with a maximum reduction of 7% to 759 deer by 2040 for the TLMP preferred alternative. The estimated deer supply for the WAA would range from 81 currently to 76 by 2040. ADF&G (1991a) suggests that deer populations in this area are probably below habitat capability.

Deer are an important subsistence resource utilized by rural Alaskans. Deer harvest data for the WAA are only available for 1987-1991. Wrangell is the only community reporting use in WAA 1812 during that time (Thornton 1993). Craig and Meyers Chuck have recorded use in the WAA sometime in the past (TLMP SDEIS). No deer have been harvested in the WAA. Thus, although hunter demand is something more than 0 it is not quantified. It seems likely that deer hunting may be done in this area during other activities, eg., fishing, or hunting other species. The 1990 hunter demand was less than or equal to 40 % of deer supply and the 2040 projected deer demand is less than or equal to 40% of deer supply (Thornton 1993).

Proposed timber harvest units being considered within the various alternatives are located within areas documented as having been utilized for deer hunting during the last fifty or more years. The projected effects to deer resulting from harvesting these units are addressed in issue 4 of the DEIS. We project that 92 percent or more of the habitat capability would still remain within the study area when the projected foreseeable future effects on deer habitat are realized. Changes in local deer herd distribution are expected to be minimal.

Abundance and distribution of mountain goats- The TLMP SDEIS predicts a habitat capability of 107 goats within WAA 1812 and a 1% reduction by 2040 under the TLMP preferred alternative. Habitat capability for the project area is estimated to be 18.4 goats, representing 17% of the goat habitat capability for the WAA. A 5% harvest rate suggest that up to 5 goats per year could be available for harvest within the WAA. ADF&G (1992b) suggests that mountain goat populations are stable to slightly increasing for all of GMU 1B.

Fourteen goats were harvested in the WAA between 1980 and 1992 (TLMP SDEIS, C. Land ADF&G, pers. comm.). From 1985 - 1992 31% of the hunters were from Wrangell, 13% were other rural Alaska residents, 14% were non-rural hunters from Alaska and 41% were non-residents (C. Land, ADF&G, pers. comm.). The best access points for hunting goats in the WAA are Marten Lake and the Kapho Mountains in the Harding River area. The Marten Lake hunters would be hunting the same herd that would winter on the West Face.

The habitat capability estimates suggest that there should be no significant changes in goat distribution in the foreseeable future as a result of the action alternatives.

Abundance and distribution of brown bear- The TLMP SDEIS estimates brown bear habitat capability at 30 animals with no expected reductions through 2040. The project DEIS predicts a maximum reduction of 4% of estimated habitat capability. ADF&G (1991b) considered brown bear populations in the area to be stable. Miller and Miller (1990) suggests a maximum harvest rate for brown bears at 5.7% under optimum conditions. This would suggest that a maximum of 1-2 brown bears per year could be available for harvest from this WAA.

Four brown bear were harvested in WAA 1812 from 1980-1989 (TLMP SDEIS). ADF&G (1991b) reports that the percentage of successful nonresident brown bear hunters in GMU 1 increased between 1985 and 1990 from 13 % to 30%.

Although brown bears may avoid clearcuts, most of the forest will be maintained in an old growth condition. Thus, it is unlikely that brown bear distribution will be significantly affected by the projected activities in the foreseeable future.

Abundance and distribution of black bear- The TLMP SDEIS estimates a current habitat capability in the WAA of 118 animals with a projected 5% decrease to 112 by 2040 under the TLMP preferred alternative. ADF&G (1992a) estimates current black bear populations in the area are high.

Four black bear were harvested in WAA 1812 between 1980 and 1989 (TLMP SDEIS). Many hunters within ADF&G's Game Management Units (GMU) 1B and 3 are nonresident hunters (55% in 1991-92, ADFG 1992a). Miller and Miller (1990) suggest a maximum harvest rate for black bears of 14% under optimum conditions. This would suggest that up to 15 bears per year could be harvested.

The habitat alterations predicted by this project are not expected to significantly change bear distribution patterns in the area within the foreseeable future.

Abundance and distribution of furbearers- Current conditions on the study area represent 100% of habitat capability. The estimated marten habitat capability within the WAA in 1954 was 82 animals with a projected reduction of 9% (to 75 animals) by 2040 under the TLMP preferred alternative (TLMP SDEIS). River otters are expected to maintain 100% of habitat capability through 2040 at 39 animals under the TLMP Revision preferred alternative. ADF&G (1991c) sees no indication that there are any population problems in the area at present.

ADF&G reports that 16 marten were trapped in the WAA between 1984 - 1988 (TLMP SDEIS). Six river otter were taken between 1980 and 1987. The number of trappers or what communities were represented is unknown.

Otters and mink predominantly use the saltwater and freshwater influence zones which will not sustain any timber harvest. Thus, there would be no expected changes in their distribution. Although marten inhabit zones that will sustain harvest their overall distribution on the study area is not expected to change significantly.

Abundance and distribution of waterfowl- Most waterfowl species do not nest on the study area and so abundance is not related to project activities. Vancouver Canada geese likely nest on the area and the TLMP SDEIS estimates that 96% of Vancouver Canada goose nesting habitat capability will be maintained in the WAA through 2040. Cohen (1989) reports that the entire Bradfield Canal area is used for waterfowl hunting by Wrangell residents. The tidal flats of the Bradfield River are much more extensive than those in the study area and thus, are a more likely destination for waterfowl hunters.

The waterfowl habitats most likely to be used by hunters are associated with the estuaries of Tom and Frank Creeks which should sustain little to no impacts. Thus, there are no expected changes to waterfowl distribution.

Access to wildlife- Access to historical subsistence use areas is not expected to be affected by any of the alternatives. Proposed roads in all action alternatives except D could improve access to areas further inland, areas which previously have not been used for subsistence hunting. Access to the study area will continue to be by traditional means, primarily personal boats, and potentially float plane. The only means to bring a motor vehicle to the area would be by boat or barge. The Alaska Marine Highway System does not serve the island and is not expected to do so in the foreseeable future. There are no known important anchorages along the sale area that would be affected by sale activities.

Competition for wildlife- Competition would be expected to temporarily increase during actual harvest activities. It is assumed that some percentage of the timber harvest work force would be eligible for subsistence harvest. Others could hunt under non-subsistence regulations. The actual level of competition would depend on the timing of activities in the area, the length of activities, and the size of the work force. Based on the size of the sale, a work force of up to approximately 35 people at any given time for up to 2 years might be expected. It is anticipated that the logging camp will be occupied seasonally. Following completion of sale activities, no additional competition would be expected because of the relative isolation of the area from population centers.

A substantial increase in competition for subsistence wildlife resources from non-rural community residents is not projected to result from the alternatives proposed. Nor is competition for those wildlife resources projected to increase in the foreseeable future due to activities proposed in this project. This is because the opportunity for easy and economical access to the study area by non-rural residents and out-of-state hunters is assumed to remain limited during the life of the proposed project. All out-of-state hunters for goats occurred during 1987 and 1988 when there was likely an outfitter/guide working in the area (C. Land ADF&G pers. comm.). There are no known connections between an increase in non-resident wildlife harvest and land management activities.

Fish and Shellfish Evaluation- Fish and shellfish are important subsistence resources used by the rural residents utilizing the analysis area. The 1987 TRUCS information indicates that fish and shellfish made up 70 and 80 percent of the per-capita harvest of principle resources harvested by subsistence users in Wrangell and Meyers Chuck respectively.

Abundance and distribution of salmon- The current abundance of salmon within the study area is assumed to reflect natural processes. This DEIS concludes that each of the action alternatives has some associated risk for impacting fish habitat within the study area. However, the use of stream buffers and the application of Best Management Practices are expected to be effective to protect fish habitat from the potential effects of the proposed action. The effects from the proposed actions for the foreseeable future are projected to be minor. Thus, the effect on the abundance and distribution of the salmon harvest for subsistence uses on the study area would be negligible. There is no reason to expect that the supply of salmon in the Bradfield Canal area is not sufficient to meet demands.

Abundance and distribution of other finfish- Other finfish include cod, halibut, rockfish, herring and hooligan. The distribution and abundance of the oceanic species is expected to be affected more by natural processes and commercial fishing regulations than the proposed action. Habitats of species that use freshwater systems should be protected by the same measures used to protect salmon habitat. The action alternatives for the study area are projected to have no impact and no foreseeable future impact on other finfish habitat. Therefore, the abundance and distribution of those other finfish would not be affected by the proposed activity.

Abundance and distribution of shellfish- The present abundance and distribution of shellfish is assumed to be primarily affected by commercial harvest and natural processes. The DEIS projects that some, although not quantified, effects on habitat for crabs, clams, and other shellfish would occur due to LTF construction on the West Face and near Frank Creek. The effect on the abundance and distribution of local crabs, clams, and other shellfish is likely to be negligible. The project effects for the foreseeable future are also projected to be negligible.

Access to fish and shellfish- Access to historic subsistence use areas is not projected to be affected by any of the proposed activities or development. Nor is there a significant possibility it would be affected in the foreseeable future because of the proposed activities related to this development. This determination is made because access to traditional subsistence use areas by boat and foot access would remain unchanged. There could be improved access via roads to reaches of streams that were not previously recorded as being used for the harvest of salmon.

Competition for fish and shellfish- The area is currently used by commercial fish and shellfish harvesters. The proposed action should not increase commercial uses. As similarly discussed concerning competition for wildlife, there may also be some increased competition for subsistence fisheries resources from timber sale operations non-resident and Alaska non-rural resident employees. However, this increase is not expected to be substantial, due to the small number of people involved, seasonal nature of activities, and the limited time frame of activities. Following sale operations, no additional competition for fish and shellfish resources would be expected.

Marine Mammals Evaluation, Abundance and distribution of marine mammals- Harbor seals are the only marine mammal in the study area available for subsistence harvest. The abundance and population trends of seals in the Bradfield Canal area are unknown but are assumed to represent natural processes. Seals were commonly seen in the area during field reconnaissance in 1992. The most likely area for human/marine mammal interface would be the LTF near Frank Creek because seal are often seen near the mouths of anadromous fish streams. Currently, there is no evidence to suggest that timber harvest and related development activities have any impact on marine mammals.

The Marine Mammal Protection Act prohibits the taking of marine mammals by anyone other than Alaska Natives. Alaska Natives harvest seal for meat, oil and hides. Wrangell has documented harvest of seals in the Bradfield Canal (Cohen 1989). In 1987 3% of Wrangell households harvested seals, accounting for 653.6 pounds of useable meat per active household.

Access to marine mammals- The proposed developments and activities associated with this project would have no effect on access to marine mammals.

Competition for marine mammals- It is likely that some of the employees of the timber operations will be Alaska Natives, and thus eligible to harvest marine mammals. However, based on the small number of people that harvest seals, the broad range of area that is used to harvest seals by Wrangell residents (Cohen 1989) and the short time frame expected for sale activities it is unlikely that there will be a significant amount of competition for this resource in this area.

Other Foods Evaluation- Other foods used for subsistence include plants such as kelp, goose tongue, and a variety of berries, etc. Though other foods did not constitute a major portion of the 1987 subsistence harvest by the rural communities documented in TRUCS, they are considered subsistence resources.

Abundance and distribution of other foods- Most traditional gathering of other foods occurs near beach and estuarine areas. With the exception for the log transfer facilities no activities proposed in the alternatives would infringe upon the beach and estuarine areas. The proposed timber harvest activity would improve the availability of berries in the units in the short-term but availability would likely decrease in the long-term. No significant affect on distribution of other foods resources is expected.

TRUCS data (ADF&G 1989) indicate plants made up approximately 2% of the per capita harvest of principle subsistence resources harvested in communities closest to the analysis area. The pounds per capita ranged from 2.3 in Wrangell to 10.7 pounds in Meyers Chuck.

Access to other foods- Other foods are a relatively minor percentage of subsistence resource harvest. Access to harvest of beach greens and seaweed/kelp would not be affected by proposal activities except in the immediate vicinity of LTF's. Access to berries would likely be improved in roaded alternatives. However, other foods are typically gathered close to town (Cohen 1989). Thus, no significant affects on access to other foods are expected due to the proposed action or within the foreseeable future.

Competition for other foods- Based on the distance of the study area from population centers, it is unlikely that there will be any competition for these resources.

Timber Evaluation- The Forest Service free-use policies in Alaska for firewood and timber remain unchanged. None of the proposed alternatives for the analysis area would restrict the availability of firewood and personal use timber. Roaded alternatives could actually increase the availability of firewood and free use timber.

Cumulative Effects- This evaluation considers whether the proposed action in combination with other past and reasonably foreseeable future actions, may significantly restrict subsistence uses. Minor beach logging has occurred on the study area in the past. The effects of that harvest are considered negligible on habitat capability. Within the Bradfield Canal area past activities include the timber sales in the Bradfield River drainage and the Tyee power plant and power line developments. As a result of the timber harvest in the Bradfield River habitat capability of many MIS in WAA 1813 are significantly decreased from the capabilities in 1954 (TLMP SDEIS). There are presumed impacts on fish habitat because of the past logging, but they are not quantified.

Future Activities- The precise location of future projects is not clearly known until such time as a project is proposed. The Canal/Hoya timber sale is tentatively scheduled for 1996. It is located directly across the Bradfield Canal from the Campbell Timber Sale and is the only other Forest Service project currently scheduled in the Bradfield Canal area. Subsistence effects due to the Canal/Hoya would likely be similar to those for the Campbell Timber Sale, being an area remote from population centers. However, in general as human populations increase and areas for subsistence gathering decrease the importance of the remaining areas will likely increase. The potential exists for a State road connecting Wrangell with the Mainland through the Bradfield Canal area. This could potentially affect access and competition for subsistence resources in the study area. However, whether and when the road project is implemented is very speculative at this time. The effects of the road project are unrelated to the current proposed action. The analysis of specific effects related to the potential future projects mentioned in this section are beyond the scope of this document. They would be analyzed in future environmental assessment documents prior to implementation.

Availability of Other Lands for the Proposed Action- The Tongass Land Management Plan makes the determinations on which uses are suitable for various parcels of land within the National Forest in Southeast Alaska. The current TLMP has determined that the study area should be managed for timber production. The TLMP is currently undergoing revision and the alternatives being considered contain a variety of land use designations for the study area. The preferred alternative allows timber production on the study area.

Within the study area an Interdisciplinary Team considers many resources when determining where to allow harvest units. That analysis is documented in an Environmental Impact Statement.

Campbell Timber Sale DEIS Findings- The Finding is based on the evaluations presented above on abundance and distribution, supply and demand, access and competition for harvested resources in the study area, WAA and Bradfield Canal area. The area does not seem to represent an important subsistence use area. This is probably due to its remoteness from population centers and the location of better harvest areas closer to those population centers.

A finding of no significant possibility of a significant restriction is in order for wildlife, fish and shellfish, marine mammals, other foods, and timber resources.

Timber Productivity

All alternatives increase timber productivity because all alternatives regenerate old-growth areas. However, each alternative varies in the number of acres of productive forest land which is regenerated.

Lack of soil disturbance with helicopter yarding may increase growth of shrubs.

Lack of soil disturbance from helicopter yarding may increase the growth of shrubs instead of trees. The growth of trees in southeast Alaska is probably most limited by the amount of light and the resulting cool soil temperatures and the major disadvantage of the overstory removal harvest method would be a reduction in growth of the regenerated stand *as compared to a clearcut*. However, clearcutting usually results in overstocking of trees and they must be thinned out in 15-30 years for optimal growth.

Overstory removal increases wood fiber productivity but not as much as clearcutting.

Using overstory removal methods, the new stand will be growing faster and putting on more wood fiber than the previous old growth stand. We also hope that some of the leave trees left will "release" and increase their growth. If this occurs, a multi-aged canopy will become established faster than under clearcutting.

Production of timber is based on the soils and which plants are adapted to those soils. Highly productive timber sites are those with a site index value of greater than 80, moderate productive lands from 61 to 80 and low productive lands are from 41 to 60. Lands with a site index below 40 are not considered capable of producing commercial timber. Site index is a measure of forest productivity determined by the height attained at a selected age.

Table 4-17, % of An Alternative's Harvest By Productivity Class

Alternative	% Acres High	% Acres Moderate	% Acres Low
B	73%	27	0
D	72	18	10
E	60	30	10
F	71	23	6
G	64	31	5

The significance of the above table shows that all alternatives concentrate on harvesting the more productive land. For example, 73% of acres harvested in Alternative B are located in high productivity areas. The more productive land is expected to be easier to regenerate than the low productive land. Natural regeneration is expected on the high and moderate productive lands and may occur on the low productive lands. The low productive areas will be the ones most likely to need planting to establish the next generation of trees.

Table 4-18, Volume Harvested By Alternative

Vol-ume	ALT. A	ALT. B	ALT. D	ALT. E	ALT. F	ALT. G
Total MMBF	0	8889	11078.2	22,127.2	15,927.6	11,658.6

Table 4-19, Harvest Acres by Volume Class

Volume Class	ALT.A	ALT.B	ALT.D	ALT.E	ALT.F	ALT.G	Pro-duc-tive Forest
4	0	0	37	212	25	25	4,711
5	0	355	390	736	607	442	5,254
6	0	28	63	59	59	30	930
7	0	0	0	0	0	0	0
Total	0	383	490	1007	691	497	10,895

Rural Area Development

The best alternative for rural development depends on the objective of the "development" and desired social conditions. There is no one preferred alternative for rural area development because each alternative emphasizes different social values. Maintaining the ability of the land to produce many goods and services may be the wisest option if you believe that diverse economies enable small towns to survive fluctuations in any one sector of the economy.

If economic value is important, Alternatives F and D have the most positive timber economic values while maintaining some of the existing and potential guided tourism values of the Tom Creek area. However, these alternatives have the greatest risk to changes in the scenery of the Bradfield. If fishing is important, Alternative D poses less risk to the fishery resource. If maintaining future development options or wildlife values is used as the criteria, Alternatives A and B emerge as best. If short-term timber related jobs are the main concern, Alternative E could employ the most people in the short-term but may cost jobs in existing and future sectors of the economy. Alternative E also would change the traditional use patterns of the area by rural residents. None of the harvest proposals effect the economic viability of future roads or transmission lines in the Bradfield.

Issue Nine

This issue addresses the impacts of a logging camp on recreationists and fish and wildlife resources. This topic is discussed in the context of other issues above. Since it was clear that you and others were concerned about this particular issue, we consolidated much of the above information into one place under this issue.

Recreation

Under all alternatives, there will likely be a temporary (1-2 year) effect on the recreation setting during harvest operations. Alternatives which harvest the most volume over the most area (Alternative E) will have the greatest potential to displace recreation users. Harvest operations which are concentrated and require less road building will have less effects (Alternatives B and D). Others may be attracted to the Bradfield by the logging operation and use of helicopter systems. The most affected group may be outfitters and guides who are transporting visitors expecting a "Wilderness" experience and will be confronted with a logging operation. If barges are used to log the west face under Alternatives D, E, F and G, traffic levels in the Bradfield Canal would increase substantially.

A floating logging camp will have the disadvantage of being "seen" by the most visitors but will somewhat limit the use of of the interior areas by logging personnel who also are seeking recreational opportunities during their time off.

Fish and Wildlife

A floating logging camp would likely eliminate the potential for bears having to be shot in camp for defense of life. However, roaded alternatives (B, E, F and G) would result in increased access for personnel to fish and wildlife resources. Species most affected by this increase in access would be bears, steelhead and cutthroat trout. Alternatives containing the most road, particularly Alternative E would have greater potential effects. The duration of activities would be proportional depend on the amount of road built and volume harvested. Increased opportunity for harvest of fish and game would last approximately 1-2 years after which populations could recover.

Issue Ten

The current Forest Service Handbook direction (USDA FSH 2409.18) requires an economic efficiency assessment to compare benefits and costs of proposed timber sale projects to determine if the sale would be an economic offering. For the Campbell timber sale project, this assessment was conducted by subtracting estimated logging and transportation costs (including road construction) from the pond log value for each action alternative. Pond log values represent the end-product selling value for wood products such as lumber, cants and pulp, minus the average manufacturing costs for those products, or what the log is worth at the mill before processing.

This appraisal of costs and revenues uses average timber values from 1979 through 1991.

In order to account for market fluctuations, timber end-product selling value is based on the median or mid-market average values from 1979 through 1991. This means that during the 12 years prior to the start of the Campbell analysis, 1/2 of the end product of the timber that has been removed from the Tongass has sold for more than the mid-market selling value, and 1/2 has sold for less.

Log selling values values vary with each alternative due to the different diameter limit cuts used.

The pond log selling values for the Campbell project vary between alternatives due primarily to differences in management prescriptions. Alternative D has a slightly higher value because the 16" + diameter prescription will yield a smaller percentage of grade 3 or less valuable smaller logs. Conversely, Alternative G, with a larger amount of 9" + diameter units (group selection) will produce a larger percentage of grade 3 logs.

Costs of logging and allowances for profit and risk are deducted from the selling value.

Stump to Truck costs as depicted in Table 4-20 include costs associated with felling and bucking, yarding, sorting and loading logs at the landings. Transportation costs include truck haul to an LTF, bundling, dumping, rafting and towing of completed rafts to the closest mill site. General Logging Overhead is an allowance for the operators administrative costs. Temporary Developments include the cost of temporary roads and the cost of moving equipment and camp facilities to the site. Specified Road Cost/Log Transfer Facility includes the estimated costs of constructing the mainline transportation system and the LTF necessary for each alternative. Profit & Risk is an allowance for the operator of normal efficiency to make a profit. Normal profit & risk varies by end product. The current allowance is 10% for cedar logs, 12% for sawlogs, and 18% for pulp. If a sale shows a positive net stumpage with an allowance of 60 percent of normal profit and risk, the sale is considered an economically viable offering. Often, sales are sold that do not reflect a positive net stumpage value after the Forest Service appraises the final sale using current values. This occurs if an operator feels that they can log the sale less expensively than the logging costs used in the appraisal or if they feel that timber market values will go up after they purchase the sale.

Prior to selling the sale, we would cruise the amount of timber and use current selling values and costs in the appraisal.

The results of the mid-market assessment and relative economic ranking of each alternative are displayed in Table 4-20. It is important to recognize that these values represent very preliminary approximations. Mid-market data is not used in the final appraisal to determine rates to be paid for timber, nor does it guarantee in any way a profit to the sale purchaser. Prior to the time the timber is made available to purchasers, a timber cruise and appraisal would be conducted using current selling values, costs, and normal (100%) profit and risk to determine the volume and value of timber made available for harvest.

Table 4-20, Alternative Economic Comparisons

Revenue	Alt B	Alt D	Alt E	Alt F	Alt G
Vol (MBF)	8,889	11,076	22,127.6	15,927.6	11,659
Selling Value ($/MBF)	281.56	290.30	284.84	285.42	280.63

Costs ($/MBF)	Alt B	Alt D	Alt E	Alt F	Alt G
Stump to Truck	160.95	148.86	152.43	155.61	162.48
Transportation	29.40	43.79	33.63	32.31	29.95

Costs ($/MBF)	Alt B	Alt D	Alt E	Alt F	Alt G
Gen. Logging Overhead	12.00	12.00	12.00	12.00	12.00
Temporary Development	2.25	1.81	2.81	1.26	1.72
Spec Road Cost/ Log Transfer Fac.	22.28	10.29	39.80	19.59	29.50
Profit & Risk @ 60%	55.37	55.57	54.25	55.32	55.05
Total Cost $/MBF	**282.25**	**272.32**	**294.92**	**276.09**	**290.70**
NET STUMPAGE	**-.69**	**17.98**	**-10.08**	**9.33**	**-10.07**

Alterantives D and F would result in positive economic values at mid-market levels.

Based on this preliminary analysis, Alternatives D and F would result in positive average stumpage values at a mid-market level and would be considered economic offerings. There are many factors affecting the net stumpage values for each of the alternatives. One major factor why Alternative D has a higher net stumpage value than F is Alternative D requires no specified road construction and the prescription requires harvesting trees at a 16 inch and greater diameter at breast height (DBH). Applying this prescription allows for a greater quality grade per log on the sale as a whole which decreases stump to truck costs and increases selling values. For Alternative F the prescriptions are a combination of 16 inch and 12 inch and greater (DBH) and specified road construction is required.

Alt B is marginally uneconomic at mid-market levels.

Alternative B is marginally uneconomical at 60% of normal profit & risk. This is due to the volume of timber harvested per cost of road needed to be built and high helicopter yarding costs. Alternatives E and G would be considered uneconomical offerings under the mid market assessment criteria due to road cost, cost of LTF construction and higher helicopter yarding costs.

Alternatives E and G are uneconomical offerings at mid-market levels.

The cost for each of the alternatives is affected by many factors. All costs required to deliver logs from the stump to the mill have to be considered when determining timber sale economics. These costs include activities associated with helicopter logging operation, conventional logging operation, specified road construction, temporary road construction, camp development, camp mobilization, and log transportation from landing to manufacturing site (helicopter water drops, helicopter landing drops, transporting and de-watering of logs, truck hauling, dump and raft, and water tow).

Other factors are volume per acre for each harvest unit, and total volume to be harvested. Stump to truck logging costs are affected by stand characteristics that vary by volume class and prescription (eg. number of logs/mbf, defect, grade, and species mix.) Logging costs are generally lower per MBF in higher volume class stands and in stands with higher minimum diameter-limit prescriptions.

All action alternatives require helicopter logging. Alternative E is the only alternative that requires both helicopter logging and conventional cable logging. Helicopter logging is a very expensive operation. The volume yarded per trip from the unit to the landing (maximum payload capacity) and yarding distance from the unit to the landing (cycle time) greatly affects the economic efficiency for helicopter logging. For helicopter logging to be economically feasible the value of timber, volume class, grade of logs, and yarding costs need to offset the high cost of road construction and logging.

Other Environmental Considerations

Irreversible and Irretrievable Commitments of Resources

Irreversible and Irretrievable Commitments of Resources are resources that we would impact that will not be returned or could return but only over long periods of time. For this analysis the irreversible disturbance of some types of cultural resources could occur on unknown sites, subsurface sites or even known sites when unplanned events occur.

We will use petroleum fuels and rock sources.

Use of petroleum fuels and rock sources for road and sort yard construction commits non-renewable resources. Only Alternative A has no effect on mineral resource use at this time.

Roading will reduce the amount of area for land designations requiring a natural character.

Roading the study area will irreversibly reduce the potential amount of area that could be designated as part of the Wilderness Preservation System or managed for other purposes that require natural characteristics. Roads would also commit a certain amount of acres of forest and muskeg and would eventually be converted over time to seed beds for grasses and alder. Alternative D would not have these consequences.

Some old-growth will be lost or reduced in habitat value.

Under all alternatives there will be an irretrievable loss of old growth forests unless rehabilitation occurs over a period of 250-300 years. Due to increased fragmentation, other old growth areas adjacent to units would have their habitat values reduced.

Unavoidable Environmental Effects

Although we designed mitigation measures, units and roads to avoid adverse consequences, some impacts to the environment cannot be completely mitigated and would be expected to occur.

Air quality would temporarily diminish.

Air quality would diminish on a recurring, temporary basis due to the construction of roads, timber harvest and hauling and barge traffic.

There are risks to soil, water and fish.

Although Best Management Practices are designed to protect soil and water, some potential for surface erosion, sediment production, channel erosion and mass movement does exist. Helicopter yarding reduces this risk considerably but road development does pose a risk of sediment production. In addition, sediment production could displace fish or result in a loss of habitat near stream crossings and temporarily affect the function of the freshwater influence zone within the ecosystem.

Human activity and habitat losses would affect wildlife and fish.

Increased human activity both during and after logging and loss of habitat would result in impacts to fish and wildlife species, particularly those populations which have low numbers or are more sensitive to the presence of people such as steelhead, cutthroat trout and brown bears. The habitat for old-growth dependent species would also be reduced. Travel corridors between old growth blocks in adjacent watersheds would also be reduced in size and fragmented which may affect the ability for individuals to disperse and genetic material to exchange among local populations of species.

Presence of the logging operation will displace other users.

Although the degree of impact varies with the alternative selected, presence of the logging operation would temporarily affect the use of the area by outfitters/guides, tourists and local recreationists. There would also be some loss of primitive and semi-primitive recreation opportunities in the study area with the roaded alternatives. The natural landscape as viewed from the Bradfield Canal could appear visually altered under some alternatives and may be noticeable to viewers. Views of travelers up the valleys would appear altered under some alternatives.

LTFs would have an impact on some areas of shellfish and finfish productivity.

Although we made efforts to select the best sites for Log Transfer Facilities, none of the recommended sites meet all the sitting guidelines developed by the Alaska Timber Task Force. The west face site and the Frank Creek sites would have the most effects to intertidal and subtidal areas and therefore have the potential to reduce the productivity of the marine zone for shellfish and finfish. The limited, one-time use and low timber volumes being handled at these sites would reduce but not eliminate these effects. This effect combined with the presence of logging personnel could temporarily impact the use of the area by commercial fishermen.

Most of these effects are relatively short term in nature (1-3 years) and only temporarily affect existing ecosystem functions. Others such as the loss of old-growth habitats and impacts to populations of bears and fish from harvest resulting from increased human access will be long-term and could affect species diversity in the study area.

Possible Conflicts With Other Land Use Objectives

The regulations for implementing the National Environmental Policy Act (NEPA) require us to determine if there are possible conflicts between the proposed action and the objectives of federal, state and local land use plans, policies and controls of the area. The major land use regulations of concern are the Coastal Zone Management Act (CZMA) and the State of Alaska's Forest Practices Act.

Coastal Zone Management Act (CZMA)- This act requires us to ensure that the activities proposed are consistent to the maximum extent practicable with the approved State coastal management program. We will use comments from the State to this Draft EIS to evaluate the alternatives and ensure that the activities proposed are consistent to the maximum extent possible with this program.

State of Alaska Forest Practices Act- This revised act is the standard used in evaluating timber harvest activities on Federal lands for the purposes of determining consistency with the Alaska Coastal Zone Management Program (ACMP, see above). It also calls for minimum 100-foot buffers on all Class one streams which reinforces the importance of these streams which are already protected under the Tongass Timber Reform Act. This act goes on to further protect those Class II streams which flow directly into Class I streams. Currently the Alaska State Division of Governmental Coordination (ADGC) and the Forest Service are revising a Memorandum of Understanding which will establish policies and procedures for coordinating State review of our programs and activities covered by the Forest Practices Act and the Alaska Coastal Management Program. Again, comments to this document, coordinated by ADGC will serve as the review of our practices to ensure consistency with the State Forest Practices Act.

Historic and Cultural Resources

The goal of the cultural resource management Program is to preserve significant cultural resources in their field setting and ensure that they remain for future research, cultural purposes and education. The direct, indirect and cumulative effects of the alternatives have been evaluated in this Chapter. There are adequate standards, guidelines and procedures to protect cultural resources and meet the above goals.

Effects on Consumers, Civil Rights, Minorities and Women

The effects of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed actions (See Issue #8, this Chapter). Other analysis in this section which is pertinent to the effects on minorities are discussed as part of the cultural resource and subsistence sections.

Chapter 5

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List of Preparers

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Chapter 6

List of Document Recipients

Listing of Document Recipients

List of Agencies, Organizations, and Individuals on the Mailing List for the Campbell EIS

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ADEC/SERO
AK Dept Fish & Game(Petersburg)
AK Dept Fish & Game-Wildlife
AK Dept Fish & Game(Wrangell)
AK Dept Fish & Game, Subsistence
AK Dept Fish & Game, Division of Subsistence
AK DNR, Division of Forestry
AK Dept Nat.Res.,Div. Land
AK Dept of Transportation & Public Facilities
AK Division Govt. Coordination
Alaska Forest Association
Alaska Natural Heritage Prog.
Alaska Pacific Trading
Alaska Public Radio Network
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AK Southeast Regional Office
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Chapter 7

Glossary

Glossary

Acronyms Used in Text

ACMP	Alaska Coastal Management Program
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
ANSCA	Alaska Native Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
BMP	Best Management Practices
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CZMA	Coastal Zone Management Act of 1976
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Environmental Impact Statement
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
KV	Knutsen-Vandenberg Act

LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
MBF	One Thousand Board Feet
MIS	Management Indicator Species
MMBF	One Million Board Feet
NEPA	National Environmental Policy Act of 1969
NFMA	National Forest Management Act
NOI	Notice of Intent
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RVD	Recreation Visitor Day
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Terms Used in Text

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 national forest wilderness areas in southeast Alaska. In section 705(a) Congress directed that at least $40,000,000 be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade. Section 810 requires evaluation of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANSCA)
ANSCA, which became law on December 18, 1971, provides for the settlement of certain land claims of Alaska natives and for other purposes.

Alpine/Subalpine Habitat
The region found on mountain peaks above conifer stands.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres. This habitat is especially important to marine and upland species.

Benthic Habitat
Refers to the substrate and organisms on the bottom of marine environments.

Best Management Practices (BMP)
Land management methods, measures or practices intended to minimize or reduce water pollution. Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

Biodiversity
Variety of life and its processes.

Buffer
Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width from each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is referred to as a buffer.

Clearcut Regeneration Method
The objective of this regeneration method is to provide site conditions favorable for the establishment, growth, and management of desired species. Cool growing conditionsm wet soils, strong winds, shallow rooted trees, abundant natural regeneration, and economic factors in southeast Alaska make this regeneration method the most desirable on most areas for stand establishment and management.

Commercial Fishery
Fish, shellfish, or other fishery resources taken or processed within a designated area for commercial purposes.

Commercial Forest Land
Productive forest land that is producing, or capable of producing, crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth, or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Standard CFL: Timber that can be economically harvested with locally available logging systems such as highlead or short-span skyline.

Nonstandard CFL: Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or longspan skyline.

Cruise
Refers to the general activity of determining timber volume and quality.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, and so on, that result from past human activities.

Cumulative Effects
Cumulative effects are the impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such action. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Deer Winter Range
A combination of environmental elements that support Sitka black-tailed deer under moderately severe or severe winter conditions. Usually associated with high volume old-growth stands at low elevation and south aspects.

Draft Environmental Impact Statement (DEIS)
A statement of environmental effects for a major Federal action released to the public and other agencies for comment and review prior to a final management decision. (Required by Section 102 of the national Environmental Policy Act.)

Estuarine Fringe Habitat
This habitat type is located within a 1,000-foot zone around an estuary. It is especially important for shorebirds, waterfowl, bald eagles, and other marine-associated species.

Estuary
For the purpose of this EIS, estuary refers to the relative flat, intertidal, and upland areas generally found at the heads of bays and mouths of streams. They are predominately mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-Aged Stand Management
A stand management strategy usually results in trees of one or two age classes within the stand. There are usually one or two entries which create site conditions favorable for seedling establishment. The three even-aged regeneration methods are seed tree, shelterwood, and clearcut. Stand regulation is simply managed by using one rotation age for a stand. The associated management costs are greatly reduced because of fewer harvest entries and stand treatments. Biological diversity is generally measured within the larger landscape or forest rather than within the even-aged stand.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

Type I: These are areas to be untouched by human activities.

Type II: Areas in which changes in the landscape are not noticed by the average person, but they do not attract attention. The natural appearance of the landscape still remains dominant.

Type III: Areas in which changes on the landscape are noticed by the average person, but they do not attract attention. The natural appearance of the landscape still remains dominant.

Type IV: Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. The natural appearance of the landscape is noticeable, it may resemble a natural disturbance.

Type V: Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.

Type VI: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be a drastic disturbance.

Fish Habitat
The aquatic environment and the immediately surrounding terrestrial environment that, combined, afford the necessary physical, biological support systems required by fish species during the various life stages.

Fish Habitat Capability
The carrying capacity or the maximum number of fish the habitat can produce. Habitat capability is measured in smolts for anadromous fish and in numbers of adult fish for resident species.

Floodplain
The lowland and relatively flat areas joining inland and coastal waters, including debris cones and flood-prone areas of offshore islands; including, at a minimum, that area subject to a 1 percent (100 year recurrence) or greater chance of flooding in any given year.

Forested Habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Group Selection Regeneration Method
Small groups of trees are removed to create new groups of uniform, balanced age classes within the stand. The openings are usually regenerated from seed of the surrounding trees. Age class regulation within groups is usually accomplished by removing unwanted trees when adjacent groups are harvested.

Habitat Capability
The number of healthy animals that a habitat can sustain.

Highlead Cable Logging
A method of transporting logs to a collecting point (landing) by using a power cable passing through a block fastened off the ground to lift the front ends of the logs clear off the ground while in transit.

Important Subsistence Use Area
Important Subsistence Use Areas include the "most-reliable" and "most often hunted" categories from the TRUCS survey and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service, Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

Individual Tree Selection Regeneration Method
Single trees are removed throughout the stand, and new trees are established soon after each harvest occurs. Regeneration is normally from seed of the surrounding trees. Age class distribution of a stand is regulated by frequent harvesting which removes trees from all age classes during each entry.

Inland Wetland Habitat
Lakes, beaver ponds, marsh lands, and associated grass/sedge meadows greater tan 10 acres, plus a 500-foot buffer.

Interdisciplinary Team
Two or more natural resource planners who use relevant information to develop alternative design and comparison for a proposed project. The team insures the integrated use of environmental, social, and economic information is clearly presented so the best decision can be made.

Intermediate Stand Treatments
A stand management treatment which manipulates stand growth, composition, structure, or tree quality. Intermediate treatments include thinning, pruning, cleaning, weeding, liberation, release, improvement, salvage, and sanitation cutting to achieve different management objectives. These stand treatments do not attempt to obtain new tree regeneration, and they occur before the final regeneration harvest. Some treatments such as salvage cutting or commercial thinning result in the harvest of forest products.

Land Use Designation
The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define, along with a set of coordinating policies, a compatible combination of management activities. The following is a descriptio of the four classifications:

LUD I: Wilderness areas.

LUD II: These lands are to be managed in a roadless state in order to retain their wildland character, but this designation would permit wildlife and fish habitat improvements, as well as primitive recreation facilities, and road development under special authorization.

LUD III: These lands may be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.

LUD IV: These lands provide opportunities for intensive resource use and development, where the emphasis is primarily on commodity or market resources.

Large Woody Debris (LWD)
Any piece of relatively stable woody material having a small-end diameter of at least 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Log Transfer Facility
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft. It is wholly or partially constructed in waters of the United States and location and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed terminal transfer facility.

Logging Camp
A temporary facility established to house industry and Forest Service personnel while timber harvest occurs in the area.

Management Area
An area of one or more VCUs for which management direction was written in the Tongass Land Management Plan. Two management areas, North Kuiu and East Kuiu, are included in this study area.

Mass Failure
The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture, and does not include individual soil particles displaced as surface erosion.

Mitigation
Includes avoiding an impact altogether by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Multiple Entry
More than one stand or land treatment activity during a rotation of a stand or area.

National Environmental Policy Act of 1969
An act declaring a National policy to encourage productive harmony between humans and their environment, to promote efforts which will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans, to enrich the understanding of the ecological systems and natural resources important to the Nation and to establish a Council on Environmental Quality.

National Forest Management Act
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest plans.

"No Action" Alternative
The most likely condition expected to exist in the future if current management direction would continue unchanged.

Notice of Intent
The Notice of Intent (NOI) to produce an EIS for the North and East Kuiu Project was published in the Federal Register on June 15, 1900. A Revised NOI was publised in the Federal Register on April 2, 1991.

Old-Growth
Ecosystems distinguished by old trees and related structural attributes.

Old-Growth Habitat
Wildlife habitat managed to maintain old-growth forest characteristics through the planning period.

Precommercial Thinning
An intermediate stand treatment in even-aged stands which removes immature or undesirable trees to reduce competition so remaining trees can more fully utilize site potential and remain in a healthy condition.

Proportionality
The Tongass Timber Reform Act of 1990 states: "eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in volume classes 6 and 7, as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area".

Recreation Opportunity Spectrum (ROS)
A system for planning and managing recreation resources that categorizes recreation opportunities into the following seven classes:

Primitive 1: A natural environment of fairly large size. Interaction between users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls.

Primitive 2: A natural environment of fairly large size adjacent to saltwater. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use may occur at infrequent levels.

Semi-Primitive Motorized: A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed to minimize on-site controls and restrictions. Local roads used for other resource management activities may be present.

Semi-primitive Non-Motorized: A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed to minimize on-site controls and restrictions. Use of local roads for recreational purposes is not allowed.

Roaded Natural: A natural-appearing environment with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.

Roaded Modified: A natural environment that has been substantially modified particularly by vegetative manipulation. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.

Rural: A natural environment that has been substantially modified by development of structures, vegetative manipulation. Structures are readily apparent and may range from scattered to small dominant clusters. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high.

Recreation Places
Identified geographical areas having one or more physical characteristics that are particularly attractive to people in recreation activities. They may be beaches, streamside or roadside areas, trail corridors, hunting areas of the immediate area surrounding a lake, cabin site, or campground.

Redd
Nest made in gravel, consisting of a depression hydraulically dug by a fish for egg deposition and then refilled with gravel.

Retention Factor
The amount of commercial forest land removed from the timber base to protect other resource values. These factors are allowances available to draw upon when meeting other resource needs and are not fixed policies to be rigidly applied by the IDT or Forest Supervisors.

Rotation
The planned number of years (approximately 100 years in Alaska) between the time that a forest stand is regenerated and its final cutting at a specified stage of maturity.

Salvage Cutting
Cutting primarily to utilize dead/down material resulting from windthrow and scattered poor risk trees that will not be marketable if left in the stand until the next scheduled harvest. Salvage sales must contain more than 50 percent by volume of dead, insect infested, or windthrown timber.

Sawlog
A log considered suitable in size and quality for producing sawn timber.

Seed Tree Regeneration Method
The objective of this regeneration method is to only leave trees which will provide seed to establish the new stand. Seed trees ususally have good form, produce seed, are of the desired species, and are spaced to ensure adequate seed distribution. After the new seedlings are established the seed trees can be left or harvested.

Silviculture
The branch of forestry involving the theory and practice of manipulating the establishment, composition, structure, and growth of forest vegetation. Silviculture involves the appropriate application of ecological, social, and economic principles of vegetative management to achieve resource management objectives and desired future forest conditions.

Silviculture Prescription
A written technical document which provides detailed implementation direction about methods, techniques, timing, and monitoring of vegetative treatments. A prescription is prepared after a preferred treatment alternative has been selected, but before the project is implemented. A prescription is prepared by a siviculturist who uses interdisciplinary imput to best achieve established objectives, direction, and requirements for land manged by USDA, Forest Service.

Slash
Debris left over a after a logging operation, ie, limbs, bark, broken pieces of logs.

Soil Hazard Areas
Mapped areas within which various soil hazards may be encountered. Hazards include mass failures and high sediment production during road construction.

Spawning Area
The available area in a stream course which is suitable for the deposition and incubation of salmon or trout eggs.

Species Diversity
The number of different species occurring in a location or under a similar environmental condition.

Stream Classification System
A means to categorize stream channels based on their fish production values. There are three stream classes on the Tongass National Forest. They are:

Class I: Streams with anadromous (fish ascending from oceans to breed in freshwater) or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream fish habitat. Also included is the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations.

Class II: Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. There streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

Class III: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Subsistence
The term "subsistence uses" means the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal, or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resource taken for personal or family consumption; and for customary trade.

Succession
Changes over time in plant and animal populations or communities. Yound, developing populations or communities usually change over time into perpetuating populations if environmental conditions do not change.

Suitability
An evaluation based upon a resource's potential use within proposed management activities.

Thousand Board Foot Measure
A method of timber measurement in which the unit is equivalent to 1,000 square feet of lumber one inch thick. It can be abbreviated Mbd, Mbm, or MBF.

Tongass Land Management Plan (TLMP)
The land allocation plan for the Tongass National Forest which serves to direct and coordinate further planning on the Forest as well as the uses carried on within the Forest on a day-to-day basis. TLMP provides management direction for a preiod of ten years.

Tongass Resource Use Cooperative Study (TRUCS)
A compilation of subsistence data for evaluating the effects of the Forest Service's action contemplated in the revision of the regional Tongass Land Management Plan.

Uneven-aged Stand Management
A forest stand management strategy which results in trees of at least 3 tree age classes. Relatively frequent harvest entries remove mature and immature trees either singly (individual tree selection) or in groups (group selection). Natural regeneration usually occurs soon after each harvest entry. Intermediate stand treatments are usually performed when the harvest entry occurs. Stand regulation or management is accomplished by manipulating stand density, stand structure, species composition, re-entry periods, and maximum tree age. These manipulation variables significantly increase the complexity of intensive forest management for uneven-aged stands. Biological diversity is generally greater within an uneven-aged stand than within an even-aged stand.

V-Notch
A relatively narrow, steep, V-shaped stream channel generally on steep, mountainous terrain.

Value Comparison Unit (VCU)
A distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established on the Tongass National Forest to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.

Visual Quality Objective (VQO)
A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree if acceptable alterations of the characteristic landscape.

Inventory VQO: Derived through application of the USDA Visual Management System. Uses three elements to determine the inventory: Sensitivity levels, distance zones, and landscape variety class. Provides a benchmark and illustrates the optimum objective based on current use patterns and sensitivity.

Adopted VQO: The VQO to be achieved as a result of management direction identified in the approved forest plan. Adopted VQO's represent the visual resource objective for the Forest Land Management Plan period, normally 10 years. (FSH 2309.22, R10 Landscape Management Handbook.)

Preservation: Management activities are generally not allowed in this setting. The landscape is allowed to evolve naturally.

Retention: Management activities are not evident to the casual forest visitor.

Partial Retention: Management activities may be evident, but are subordinate to the characteristic landscape.

Modification: Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground (1/4 to 5 miles from viewer).

Maximum Modification: Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Volume
Stand volume based on standing net board feet per acres by Scribner Rule.

Volume Class
Average timber stand volume, given as thousand board feet per acre. The volume classes used in this EIS are: 8 to 20, 20 to 30, 30 to 50, and 50+ MBF/acre.

Wetland
Those areas that are inundated by surface or ground water frequently enough to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wildlife Habitat
The locality where the species may be found and where all essentials for its development and existence are present.

Wildlife Habitat Management Unit (WHMU)
An area of wildlife habitat identified during the IDT process as having wildlife values of such importance that the habitat within the management area designated by the IDT is managed with wildlife as the primary resource value.

Windthrow (Blowdown)
Trees which the wind has blown over (windthrown) or broken the main stem (wind snap).

Chapter 8

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Appendix A

Unit and Road Cards

SAMPLE UNIT CARD

The following is a sample unit card. Below each section is a short explanation. Abbeviations and special terms are also explained.

CAMPBELL TIMBER SALE	UNIT X	IN ALTERNATIVES D, E	16" OSRwLT
		IN ALTERNATIVES B, F, G	12" OSRwLT

"Campbell Timber Sale" - The name of the timber sale. "UNIT X " is the number of the unit. "In ALTERNATIVES D, F" lists which alternatives the unit is in. "16"" is the diameter of the smallest tree to be removed. "OSR" means an overstory removal, "wLT" means some extra trees are marked to be left. An overstory removal harvest is removing the largest trees down to a specified diameter limit or height. The second line "IN ALTERNATIVES B, F, G 12" OSRwLT means that in alternatives B, F, and G trees larger than 12" in diameter will be removed and some larger trees will be marked to be left.

Total Acres 30 Treatment Acres 30 Harvest Acres 30

"TOTAL ACRES" is the size of the stand in acres. "Treatment Acres" the acres affected by the area logged. "Harvest Acres" the estimated number of acres to be logged. Treatment acres can be larger than harvest acres if only part of the stand is harvested. With a group selection harvest the treatment acres would be the entire stand even if only 10% of the area is harvested.

16" OSRwLT Harvest Volume 700 Harvest volume class VC5 25 VC6 5
12" OSRwLT Harvest Volume 725 Harvest volume class VC6 25 VC6 5

"16" OSRwLT Harvest Volume 700 " is the estimated volume in thousands of board feet (MBF) to be removed by the harvest method listed (same as above) Harvest volume class VC6 25" is the volume class (VC) of the area and the number of acres in that volume class. The following explains volume classes.

Volume class	Description	Abbreviation
Volume class 4	8,000 to 20,000 board feet per acre	8-20 MBF
Volume class 5	20,001 to 30,000 board feet per acre	20-30 MBF
Volume class 6	30,001 to 50,000 board feet per acre	30-50 MBF

The second line 12" OSRwLT means an overstory removal harvest of trees larger than 12 inches in diameter, leaving some trees larger than 12 inches for a total volume in the unit of 725 MBF (thousand board feet) from 25 acres with a volume of 20-30 MBF and harvest of 5 acres with a volume of 30-50 MBF.

Elevation 120-480 Aspect: East

"Elevation is the number of feet above sea level" "Aspect" is which direction most of the unit faces.
"Plant Association" Percent listing of the various plant association in the unit.

DESCRIPTION: This section gives a very brief description of the unit.

DESIRED FUTURE CONDITION: Short term - This section described what is desired for the first 15-20 years after harvest.

Long term - The section explains the desired conditions more than 20 years in the future

Prescription: The list of treatments to the unit that will start the stand towards meeting the desired future condition

LOGGING SYSTEMS: This section describe how the unit will be logged, that is with a cable or helicopter yarding method and some time estimates to fell and yard the unit.

Other Prescriptions Considered. There are other treatments considered and not selected and why this treatment was not selected.

CAMPBELL TIMBER SALE UNIT 1 IN ALTERNATIVES D, E, F 16" OSR

Total Acres 10 Treatment Acres 25 Harvest Acres 25

16" OSR Harvest Volume 270 Harvest volume class VC6 10

Elevation: 1,300-1,700 feet Aspect: South Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the saltwater facing zone and below the alpine zone. Unit 1 is in goat winter range and is located close to the alpine zone. There are no fisheries concerns in this unit.

DESIRED FUTURE CONDITION: Short term - Minimize disturbance during mountain goat kidding and hunting seasons from helicopters. Visitors to the Bradfield Canal will notice harvest units and units will appear natural. After harvest units will appear to have a texture change from the surrounding areas will meet the objective of partial retention. Straight lines and large opening will not be visible from saltwater. Maintain current human access. Unit will regenerate naturally with a predominance of hemlock and will be vigorous.

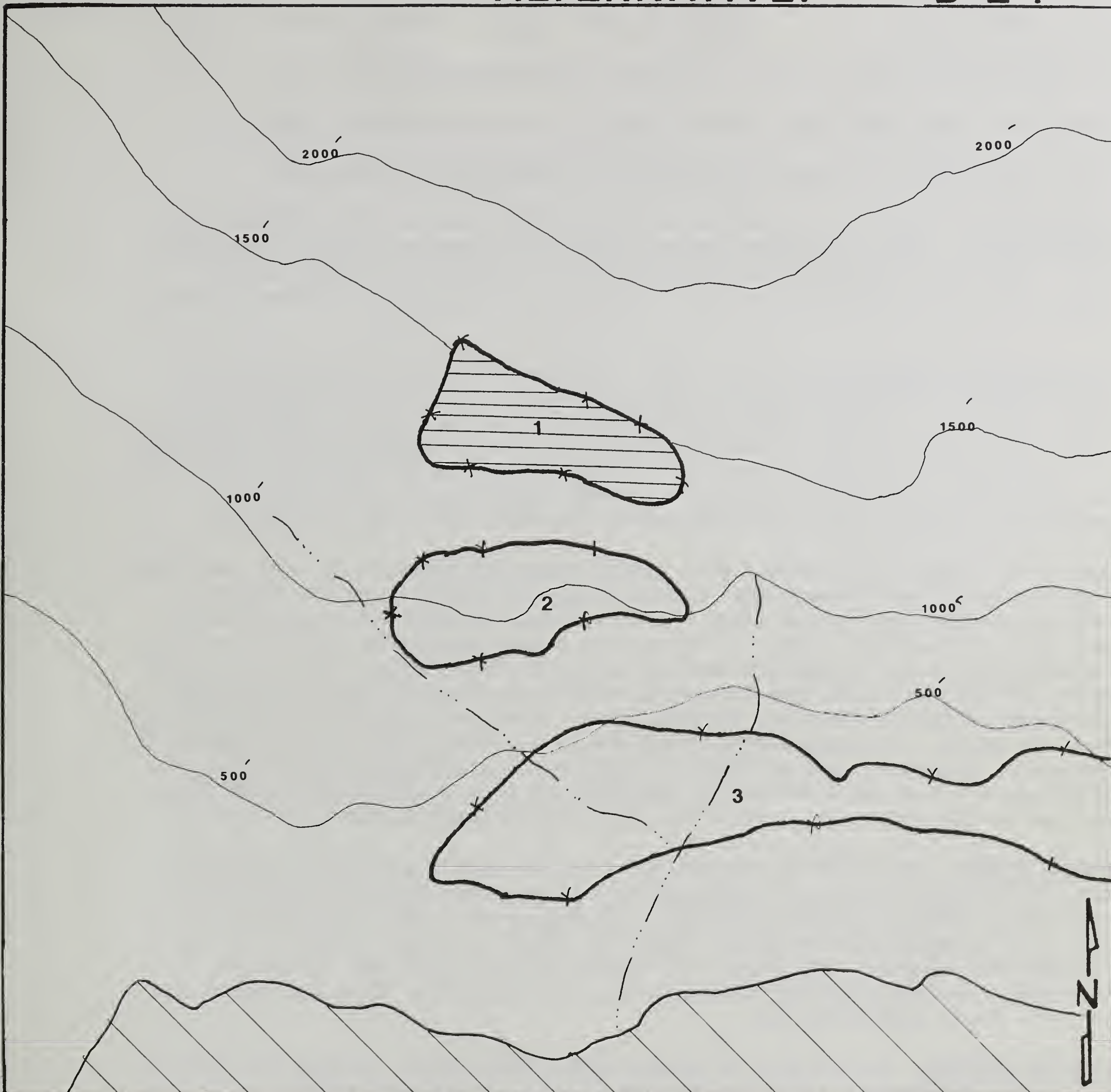
Long term - Maintain goat and deer winter range and maintain up and down slope migration corridors between goat winter range and summer range and seek to retain valuable goat winter range characteristics of snow interception in the west face of the VCU. Maintain habitat for alpine-associated wildlife species including goats and maintain migration corridors between the alpine and upland zones and maintain migration corridors between the Campbell and the adjacent drainages of Martin Creek and Harding River. Provides summer range habitat for mountain goats. Increase productivity for sawlogs and higher value products is expected. Branches and tops should return to the pre-logging condition in 20-30 years. Unit will provide to wildlife for snow interception sooner than harvest to 12 inch limit. Unit will have a multi-storied canopy over time.

PRESCRIPTION: Unit will be managed as an uneven-aged stand. Regeneration will be established by removing the overstory with an extended rotation of 120-150 years. Provide protection to goat kidding areas. Trees less than 16 inches in diameter will be felled only for safety. Leave as many cull trees standing as possible. All eagle nest trees will be protected. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Units 1 will be yarded with a helicopter. Access for falling will be by helicopter. Unit 1 will take approximately 9 days to fall and 3 days to yard.

Other Prescriptions Considered. Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals and not meeting snow interception needs.

UNIT 1 ALTERNATIVE: D E F



1 inch = 660 feet

0 660 1320 1980

Logging System

Helicopter

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 2 IN ALTERNATIVES D, E, F 16" OSR

Total Acres 11 Treatment Acres 25 Harvest Acres 25

16" OSR Harvest Volume 297 Harvest volume class VC6 11

Elevation: 800-1,200 feet Aspect: South Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the saltwater facing zone and below the alpine zone. Unit is in goat winter range and is located close to the alpine zone. There is a class III on the west side of the unit and there are no anticipated water quality concerns. There are no fisheries concerns for this unit.

DESIRED FUTURE CONDITION: Short term - Minimize disturbance during mountain goat kidding and hunting seasons from helicopters. Visitors to the Bradfield Canal will notice harvest units and units will appear natural. After harvest units will appear to have a texture change from the surrounding areas will meet the objective of partial retention. Straight lines and large opening will not be visible from saltwater. Maintain current human access. Unit will regenerate naturally with a predominance of hemlock and will be vigorous.

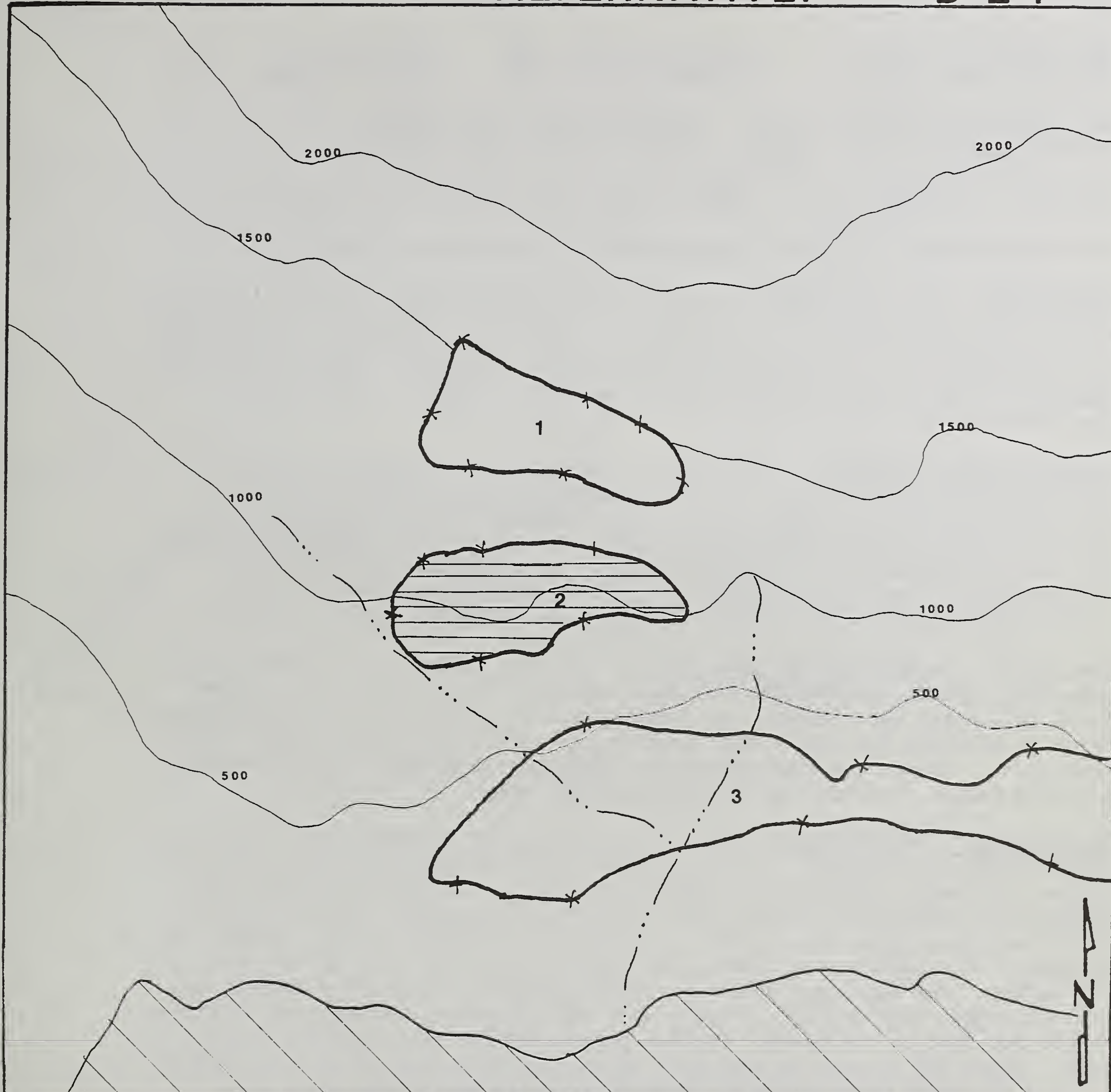
Long term - Maintain goat and deer winter range and maintain up and down slope migration corridors between goat winter range and summer range and seek to retain valuable goat winter range characteristics of snow interception in the west face of the VCU. Maintain habitat for alpine-associated wildlife species including goats and maintain migration corridors between the alpine and upland zones and maintain migration corridors between the Campbell and the adjacent drainages of Martin Creek and Harding River. Provides summer range habitat for mountain goats. Increase productivity for sawlogs and higher value products is expected. Branches and tops should return to the pre-logging condition in 20-30 years. Unit will provide to wildlife for snow interception sooner than harvest to 12 inch limit. Unit will have a multi-storied canopy over time.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with a extended rotation of 120-150 years. Regeneration will be established by removing the overstory. Provide protection to goat kidding areas. Trees less than 16 inches in diameter will be felled only for safety. Leave as many cull trees standing as possible. All eagle nest trees will be protected. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit 2 will be yarded with a helicopter. Access for falling will be by helicopter. Unit 2 will take 10 days to fall and yarding will take 3 days.

Other Prescriptions Considered. Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals and not meeting snow interception needs.

UNIT 2 ALTERNATIVE: D E F



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE   UNIT 3   IN ALTERNATIVES D, E, F 16" OSR/w/EX
IN ALTERNATIVES G 9" GS

OSR/w/EX Tot Ac	52	Treatment Acres	52	Harvest Acres	52
GS Total Acres	52	Treatment Acres	52	Harvest Acres	17

16" OSR Harvest Volume	1,080	Harvest volume class	VC6 25
9" GS Harvest Volume	435	Harvest volume class	VC6 25

Elevation: 150-600 feet   Aspect: East   Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: Unit is located in the saltwater facing zone. An eagle tree is located about 650 feet to the southeast. A class III stream forks just inside the south boundary in the west half of the unit. Both forks flow through the unit and these have no anticipated water quality concerns. There are two other class III stream in the eastern half of the unit. There are no fisheries concerns with this unit.

DESIRED FUTURE CONDITION: Short term - Visitors to the Bradfield Canal will notice harvest unit but the unit will appear natural and meet the partial retention visual quality objective. After harvest units will appear to have a texture change from the surrounding areas. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock. Maintain migration corridors up and down slope between goat winter range and summer range. No decrease in water quality.

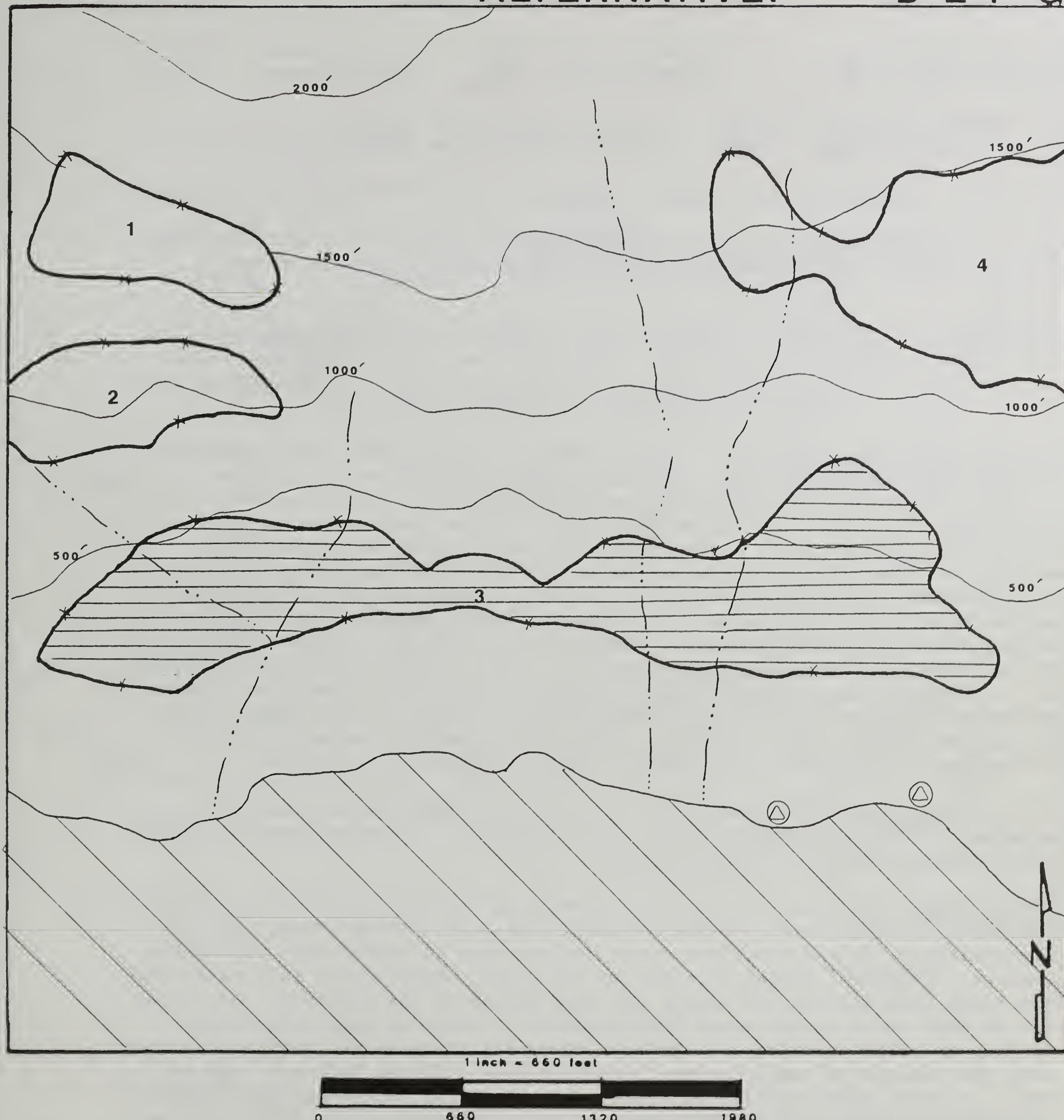
Long term - Increase productivity for sawlogs and higher value products is expected. Western hemlock will be most numerous tree. Stand will be have trees in several age classes. In alternatives D, E, and F unit will provide value to wildlife for snow interception range sooner that harvest to 9 inch tree size. Slash from tops and limbs should return to pre-logging conditions in 20-30 years. Maintain goat and deer winter range.

PRESCRIPTION: Establish new stand by harvesting the overstory with an extended rotation of 120-150 years. For alternatives D, E, and F trees less than 16 inches in diameter will only be felled for safety. Narrow unit allows for migration up slope and also provide 2 slash free corridors. Directional fall trees away from slash free corridor or remove any tops and slash felled in the corridor. For alternative G trees smaller than 9 inches will be felled only for safety. For any alternative selected provide an irregularly shaped unit and vary edges and backline to blend with the landscape. No harvest of timber within 500 foot of the beach. Provide protection for goats and the eagle tree. Class III streams on east half of unit to be protected as described in Class c of timber sale contract. Monitor wildlife use of the slash free corridors. Ensure directional falling away from middle stream just east of the constriction. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. Under alternatives D, E, and F it will take two fallers approximately 36 days to fall and 11 days to yard. Under alternative G it will take two fallers about 14 days to fall and 5 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 3 ALTERNATIVE: D E F G



Logging System
Helicopter

- Unit Proposed
- Adajent Unit Proposed
- Proposed Specified Road
- Proposed Temporary Road
- Landing
- Stream - Class I
- Stream - Class II
- Stream - Class III
- Saltwater & Lakes
- Log Transfer Facility
- Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 4 IN ALTERNATIVES D, E, F 16" OSR/w/LT
IN ALTERNATIVES G 9" GS

OSR/w/LT Tot Ac	58	Treatment Acres	58	Harvest Acres	58
GS Total Acres	58	Treatment Acres	58	Harvest Acres	19

16" OSR Harvest Volume	1,350	Harvest volume class	VC6 25
9" GS Harvest Volume	551	Harvest volume class	VC6 25

Elevation: 1,000-1,700 feet Aspect: South Site Productivity: Low-High

Plant association is 46% western hemlock/blueberry/spinulose shield fern, 40% Mountain hemlock, and 14% western hemlock-Alaska cedar/blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the saltwater facing zone and below the alpine zone. There is an eagle tree about 2000 feet south of the unit. There is a class III stream in the western portion of the unit. No anticipated water quality concerns. There are no fisheries concerns in this unit.

DESIRED FUTURE CONDITION: Short term - Maintain up and down slope migration corridors between goat winter range and summer range and seek to retain valuable goat winter range characteristics in the west face of the VCU. Maintenance of habitat for alpine-associated wildlife species and migration corridors between the alpine and upland zones and migration between the Campbell and the adjacent drainages of Martin Creek and the Harding River will be maintained. Provides summer range habitat for mountain goats. Maintain current human access and minimize disturbance during mountain goat kidding and hunting seasons from helicopters. Visitors to the Bradfield Canal will notice this unit but the unit will appear natural. After harvest unit will appear to have a texture change from the surrounding area and unit is predicted to meet partial retention visual quality objective. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock in the moderate and highly productive sites.

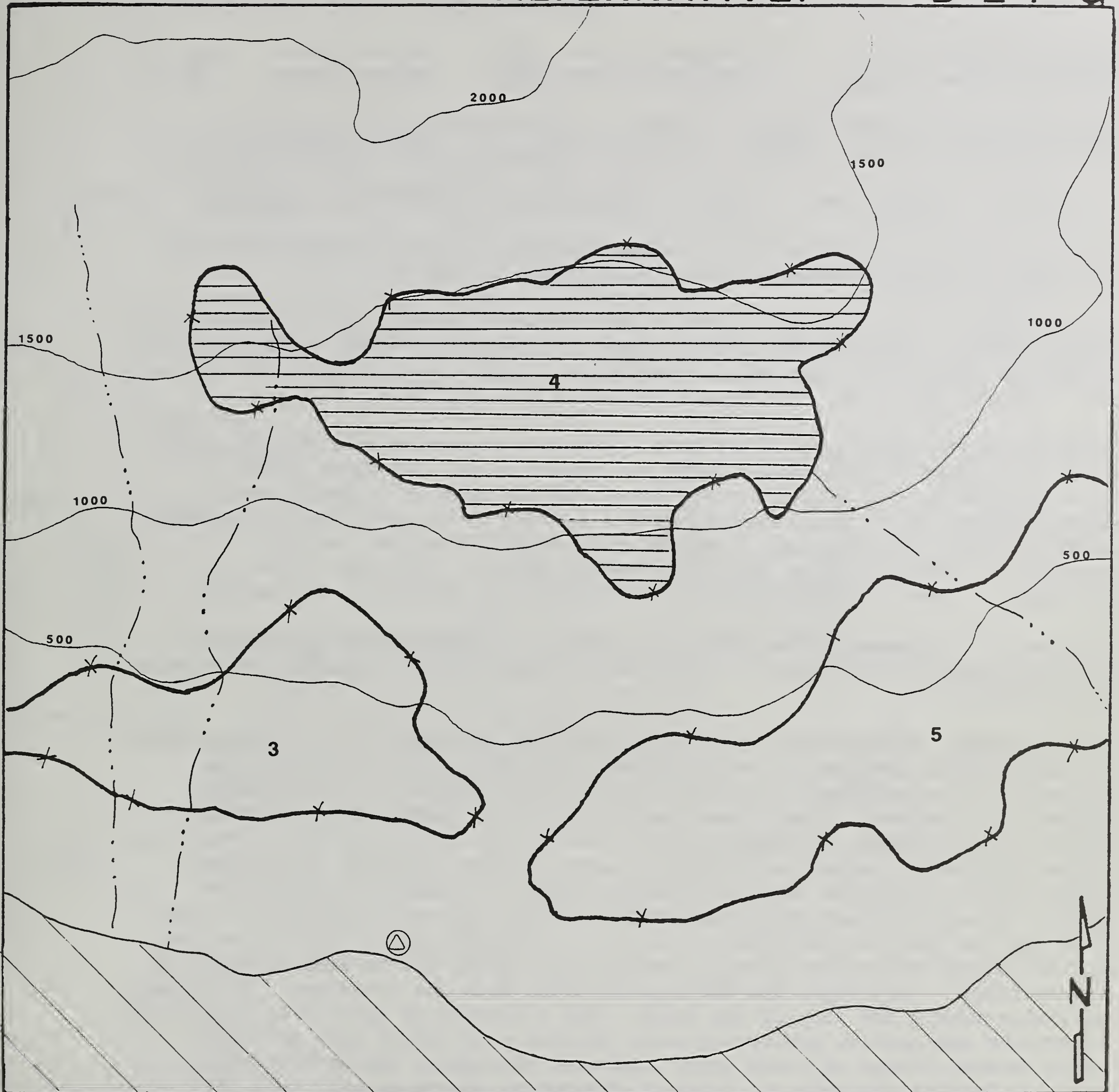
Long term - Increase productivity for sawlogs and higher value products is expected. Two storied patchy stand. Tops and branches are expected to return to pre-logging conditions on 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory with an extended rotation of 12-150 years. Provide protection to goat kidding areas. For alternatives D, E, and F harvest trees smaller than 16 inches only for safety concerns. Provide 1 travel corridor up the slope. Directional fall trees away from slash free corridor or remove any tops felled in the corridor. All trees will be left uncut in the slash free corridor. Leave as many cull trees standing as safety permits and avoid leaving cull trees in the northwest corner along the v notch to avoid having trees blow over. Clumps left can include large low value mixed species of trees. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit 4 will be yarded with a helicopter. Access for falling will be by helicopter. In alternatives D, E, and F unit 4 will take two fallers approximately 57 days to fall and 17 days to yard. The group selection alternative will take two fallers about 19 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals and maintaining goat winter habitat.

UNIT 4 ALTERNATIVE: D E F G



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 5 IN ALTERNATIVES D, E, F 16" OSR/w/LT
IN ALTERNATIVES G 9" GS T

OSR Total Acres	55	Treatment Acres	55	Harvest Acres	55
GS Total Acres	55	Treatment Acres	55	Harvest Acres	18

16" OSR Harvest Volume	1,352	Harvest volume class	VC4 6 ac VC5 42 ac
9" GS Harvest Volume	364	Harvest volume class	VC4 2 ac VC5 16 ac

Elevation: 220-650 feet Aspect: South Site Productivity: Mod-High

Plant association is 89% western hemlock/blueberry/spinulose shield fern and 11% western hemlock-Alaska cedar/blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the saltwater facing zone adjacent to the beach fringe. The V-notches shown on map are class III streams. There are no fisheries concerns in this unit. There is an eagle tree located about 650 feet west of the unit.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and unit is predicted to meet partial retention visual quality objective. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock.

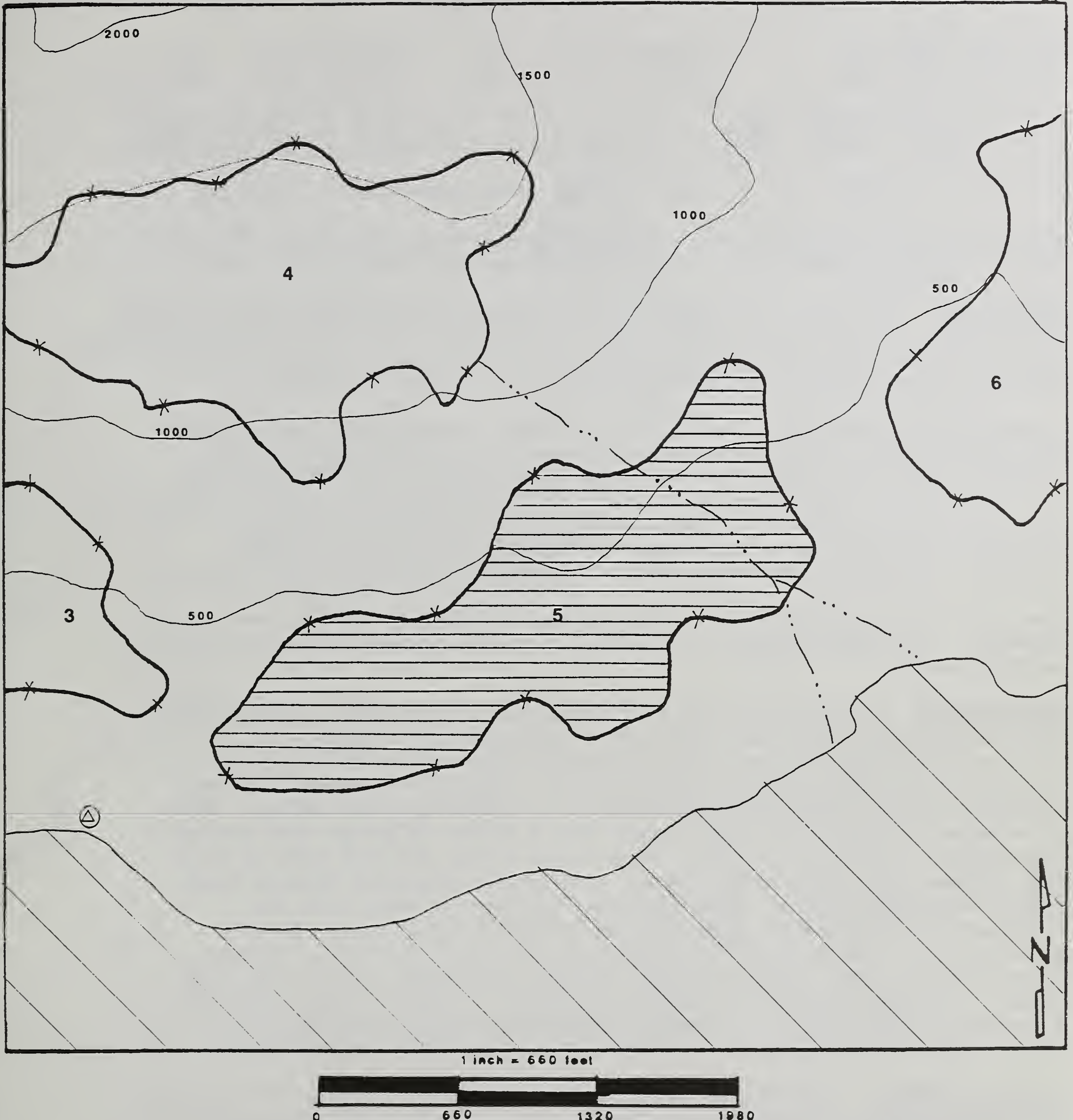
Long term - Increase productivity for sawlogs and higher value products is expected. Tops and branches are expected to return to pre-logging conditions on 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven-aged stand multi-storied patchy stand with trees in several age classes with an extended rotation of 120-150 years. Provide an irregularly shaped unit boundary. Trees less than 16 inches in diameter will be felled only for safety under alternatives D, E, and F. Alternative G will harvest the stand with small groups that average 2 acres in size. Unit is above beach fringe and will have an uncut area between unit 5 and unit 6 to allow for migration between beach fringe and upslope areas. Directional fall trees away from the one assigned slash free corridors. Corridor will be located to use natural breaks and steep areas in the unit and trees will be left standing in the corridor. Vary edges and backline to blend with the landscape. No harvest of timber within 500 foot of the beach. Use v-notches as split line or part of a corridor and provide protection under Section c of timber sale contract. Leave several clumps of trees uncut scattered throughout the unit on rocky areas to breakup visually and maintain diversity. Leave as many cull trees standing as safety permits. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. In alternatives D, E, and F unit 5 will take two fallers 45 days to fall and 14 days to yard. Alternative G will take two fallers about 17 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 5 ALTERNATIVE: D E F G



Logging System

Helicopter

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 6 IN ALTERNATIVES D, E, F 16" OSR/w/LT
IN ALTERNATIVES G 9" GS

OSR Total Acres 41 Treatment Acres 41 Harvest Acres 41
GS Total Acres 44 Treatment Acres 44 Harvest Acres 14

16" OSR Harvest Volume 874 Harvest volume class VC4 8 ac VC5 24 ac VC6 9
9" GS Harvest Volume 364 Harvest volume class VC4 2 ac VC5 10 ac VC6 2

Elevation: 200-530 feet Aspect: South Site Productivity: Mod-High

plant association is 59% western hemlock/blueberry/spinulose shield fern, 17% western hemlock-Alaska cedar/blueberry/skunk cabbage, and 24% Sitka spruce.

DESCRIPTION: This unit is located in the saltwater facing zone adjacent to the beach fringe. There are three are class III streams in the unit. There are no fisheries concerns in this unit. Fisheries concerns area associated with the possible sort yard location and associated long transfer facility.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and unit is predicted to meet partial retention visual quality objective. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock.

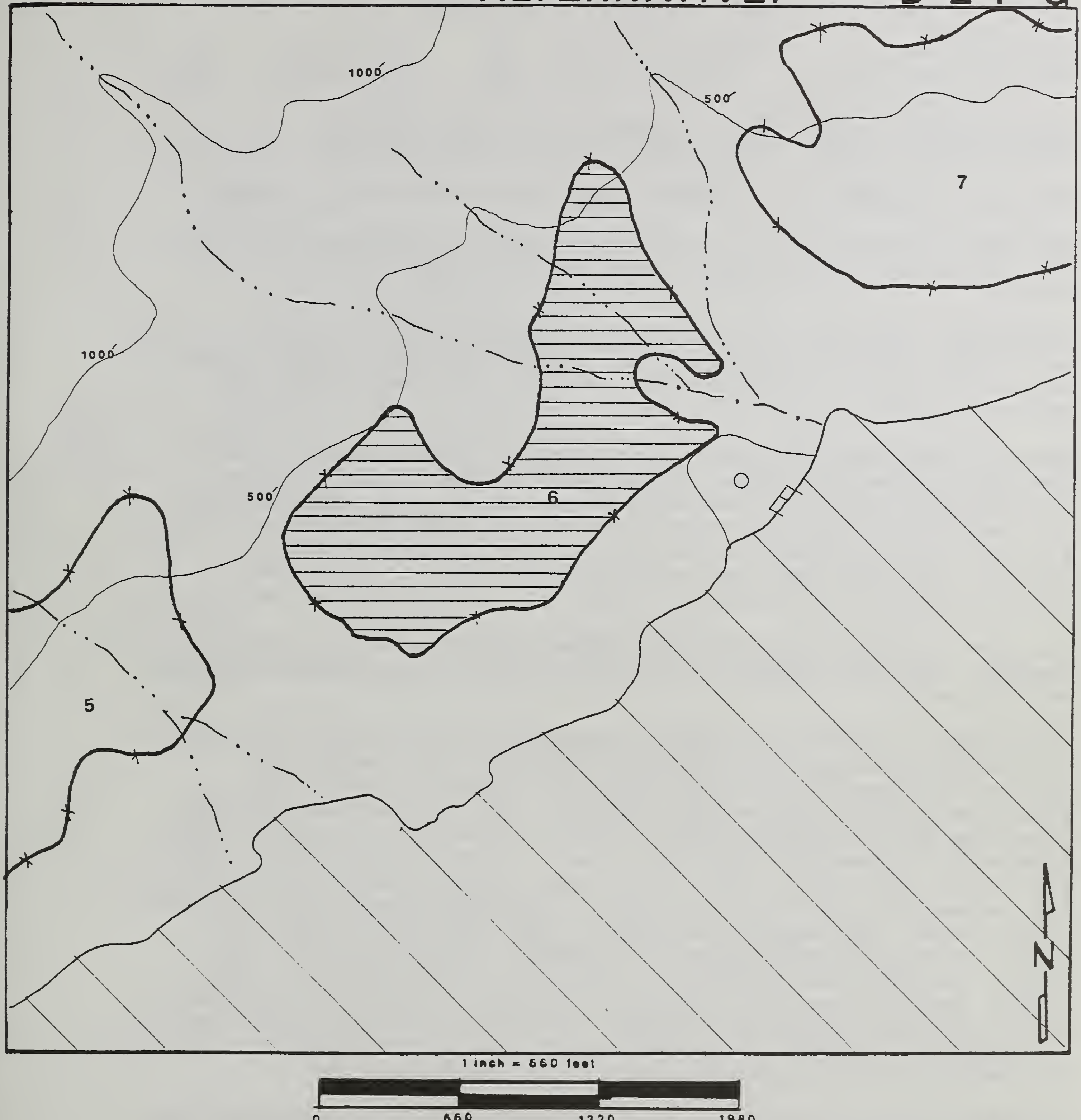
Long term - Increase productivity for sawlogs and higher value products is expected. Tops and branches are expected to return to pre-logging conditions on 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage the stand as an uneven aged stand with trees in several age classes with multi-storied canopy layers with an extended rotation of 120-150 years. Provide an irregularly shaped unit boundary. Under alternatives D, E, and F trees less than 16 inches in diameter will be felled only for safety. Under alternative G harvest all trees larger than 9 inches in groups that average 2 acres will be harvested. Unit is above beach fringe and will have an uncut area between unit 6 and units 5 and 7 to allow for migration between beach fringe and upslope areas. Vary edges and backline to blend with the landscape. No harvest of timber within 500 foot of the beach. Provide protection under Section c of timber sale contract for class III streams. Leave several clumps of trees uncut scattered throughout the unit on rocky areas to breakup visually and maintain diversity. Leave as many cull trees standing as safety permits. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. In alternatives D, E, and F unit 6 will take two fallers 30 days to fall and 9 days to yard. Alternative G will take two fallers about 13 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 6 ALTERNATIVE: D E F G



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 7 IN ALTERNATIVES D, E, F 16" OSR/w/LT
IN ALTERNATIVES G 9" GS

OSR Total Acres 56	Treatment Acres 56	Harvest Acres 56
GS Total Acres 56	Treatment Acres 56	Harvest Acres 18

16" OSR Harvest Volume 1,315 Harvest volume class VC5 56 ac
9" GS Harvest Volume 486 Harvest volume class VC5 18 ac

Elevation: 200-800 feet Aspect: South Site Productivity: Low-High

The plant association is 18% western hemlock/blueberry/spinulose shield fern, 57% western hemlock-Alaska cedar/blueberry/skunk cabbage, and 25% mountain hemlock.

DESCRIPTION: This unit is located in the saltwater facing zone adjacent to the beach fringe. There are two class III streams in the unit, and the western most stream forks just below the unit boundary. There are no fisheries concerns in this unit.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and unit is predicted to meet partial retention visual quality objective. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock.

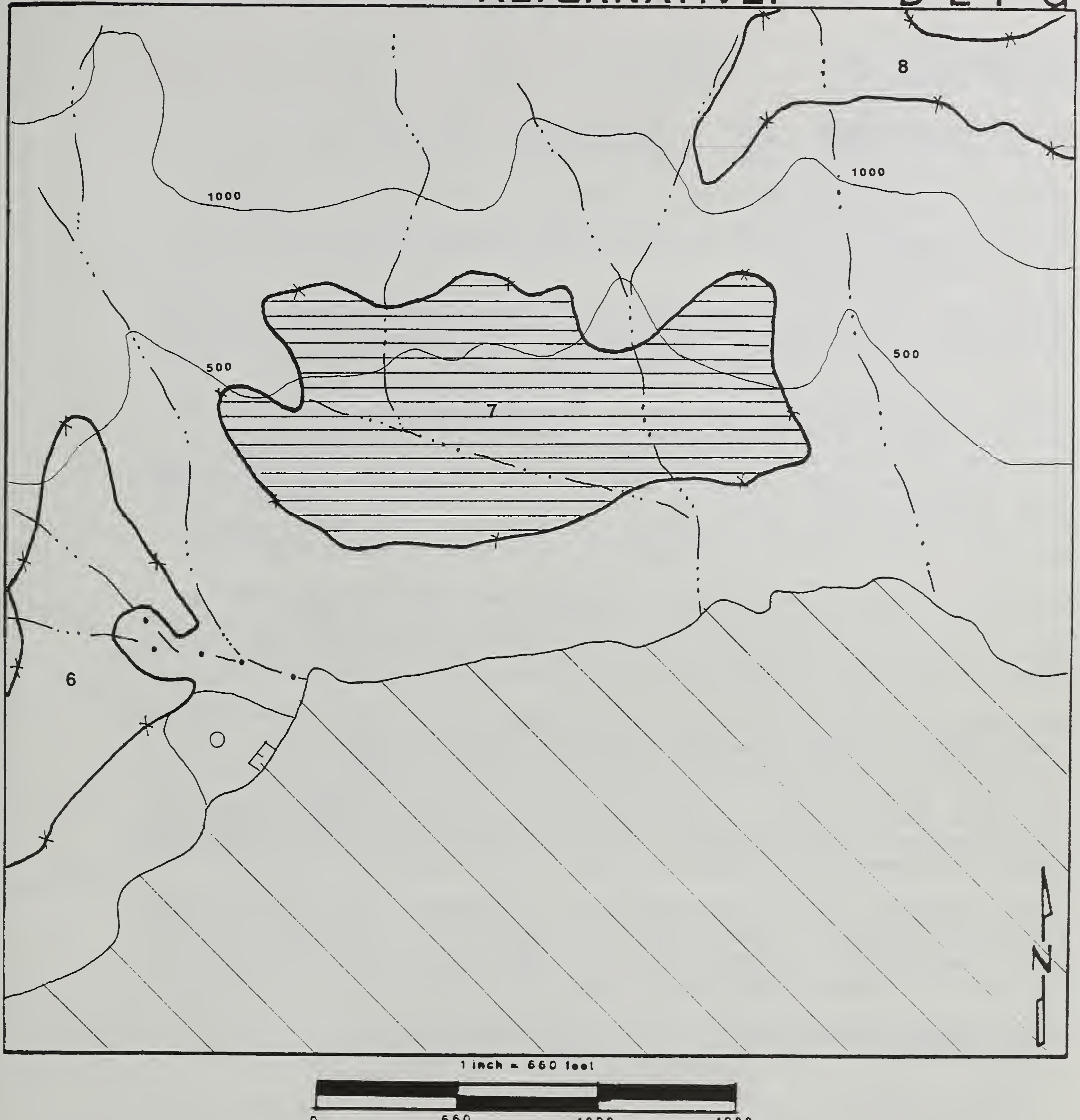
Long term - Increase productivity for sawlogs and higher value products is expected. Tops and branches are expected to return to pre-logging conditions on 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Manage the stand as an uneven aged stand with trees in several age classes with multi-storied canopy layers with an extended rotation of 120-150 years. Provide an irregularly shaped unit boundary. Under alternatives D, E, and F trees less than 16 inches in diameter will be felled only for safety. Under alternative G harvest all trees larger than 9 inches in groups that average 2 acres will be harvested. Unit is above beach fringe and will have an uncut area between unit 7 and unit 6 to allow for migration between beach fringe and upslope areas. Vary edges and backline to blend with the landscape. No harvest of timber within 500 foot of the beach. Provide protection under Section c of timber sale contract for class III streams (see map). Leave several clumps of trees uncut scattered throughout the unit on rocky areas to breakup visually and maintain diversity. Leave as many cull trees standing as safety permits. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. In alternatives D, E, and F unit 7 will take two fallers 44 days to fall and 14 days to yard. Alternative G will take two fallers about 17 days to fall and 5 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 7 ALTERNATIVE: D E F G



Logging System

Helicopter

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 8 IN ALTERNATIVES D, E, F 16" OSR
IN ALTERNATIVES G 9" GS

OSR Total Acres	25	Treatment Acres	25	Harvest Acres	25
GS Total Acres	22	Treatment Acres	22	Harvest Acres	8

16" OSR Harvest Volume	500	Harvest volume class	VC5 25 ac
9" GS Harvest Volume	184	Harvest volume class	VC5 8 ac

Elevation: 1,000-1,400 feet Aspect: South Site Productivity: Low,High

The plant association is 72% western hemlock/blueberry/spinulose shield fern and 28% mountain hemlock.

DESCRIPTION: This unit is located in the saltwater facing. There is a class III streams in the western portion of the unit, and another class III stream just west of the west boundary. There are no fisheries concerns in this unit.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and will meet the visual quality of partial retention. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock in the areas of high productivity.

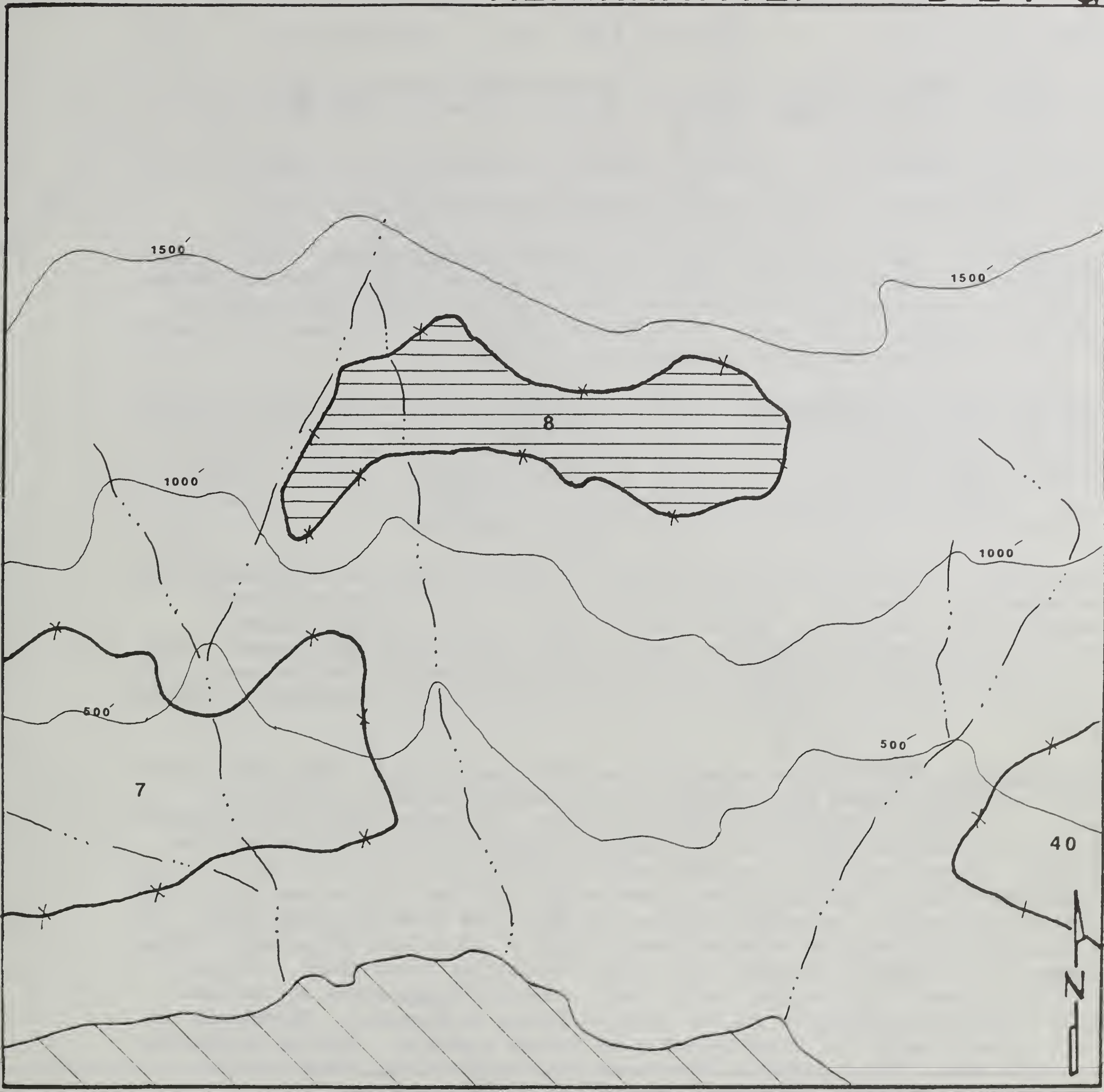
Long term - Increase productivity for sawlogs and higher value products is expected. Unit will provide value to wildlife for snow interception in winter range sooner that harvest to 9" tree size. Tops and branches are expected to return to pre-logging conditions on 20-30 years. Multi-storied stand.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven-aged stand with an extended rotation of 120-150 years. Under alternatives D, E, and F trees less than 16 inches in diameter will be felled for safety. Under alternative G average size of the opening harvested to a 9 inch limit will be 2 acres. Provide protection for goats. Leave as many cull trees standing as safely possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 8 under alternatives D, E, and F will take two fallers approximately 17 days to fall and 5 days to yard. Under Alternative G two fallers will need about 7 days to fall and 2 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 8 ALTERNATIVE: D E F G



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 8 IN ALTERNATIVES D, E, F 16" OSR
IN ALTERNATIVES G 9" GS

OSR Total Acres	25	Treatment Acres	25	Harvest Acres	25
GS Total Acres	22	Treatment Acres	22	Harvest Acres	8

16" OSR Harvest Volume	500	Harvest volume class	VC5 25 ac
9" GS Harvest Volume	184	Harvest volume class	VC5 8 ac

Elevation: 1,000-1,400 feet Aspect: South Site Productivity: Low,High

The plant association is 72% western hemlock/blueberry/spinulose shield fern and 28% mountain hemlock.

DESCRIPTION: This unit is located in the saltwater facing. There is a class III streams in the western portion of the unit, and another class III stream just west of the west boundary. There are no fisheries concerns in this unit.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and will meet the visual quality of partial retention. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock in the areas of high productivity.

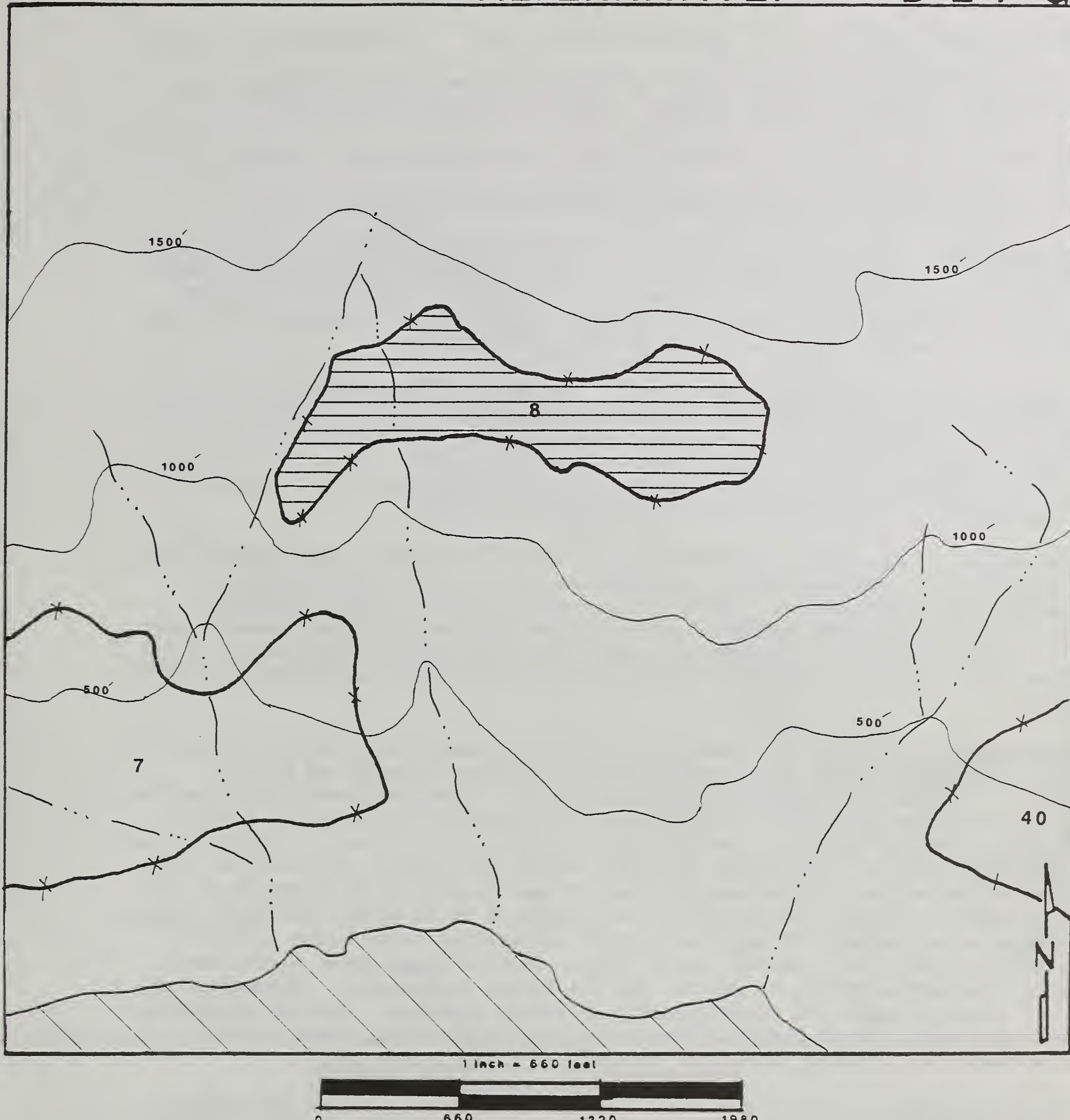
Long term - Increase productivity for sawlogs and higher value products is expected. Unit will provide value to wildlife for snow interception in winter range sooner that harvest to 9" tree size. Tops and branches are expected to return to pre-logging conditions on 20-30 years. Multi-storied stand.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven-aged stand with an extended rotation of 120-150 years. Under alternatives D, E, and F trees less than 16 inches in diameter will be felled for safety. Under alternative G average size of the opening harvested to a 9 inch limit will be 2 acres. Provide protection for goats. Leave as many cull trees standing as safely possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 8 under alternatives D, E, and F will take two fallers approximately 17 days to fall and 5 days to yard. Under Alternative G two fallers will need about 7 days to fall and 2 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 8 ALTERNATIVE: D E F G



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 9 IN ALTERNATIVES D, E 16" OSR/w/LT
IN ALTERNATIVES B, F, G 12" OSR

Total Acres 28 Treatment Acres 28 Harvest Acres 28

16" OSR/w/LT Harvest Volume 700 Harvest volume class VC6 28
12" OSR Harvest Volume 725 Harvest volume class VC6 28

Elevation: 200-500 feet Aspect: East Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the saltwater facing zone. Unit is above Frank Creek. There is a small class III flowing through the north east corner of the unit and after the stream leaves the unit the stream flows along the northern boundary of the unit. Frank Creek is about 130 feet east of the unit. There is an eagle tree about 1,900 feet south of the unit.

DESIRED FUTURE CONDITION: Short term - The unit will meet the visual quality objective of partial retention and unit will appear to have a texture change from the surrounding areas. Straight lines and large opening will not be visible from saltwater. Future stand to appear irregular, patchy and have at least two different stories composed mainly of western hemlock. A naturally regenerated unit, predominantly with hemlock is expected.

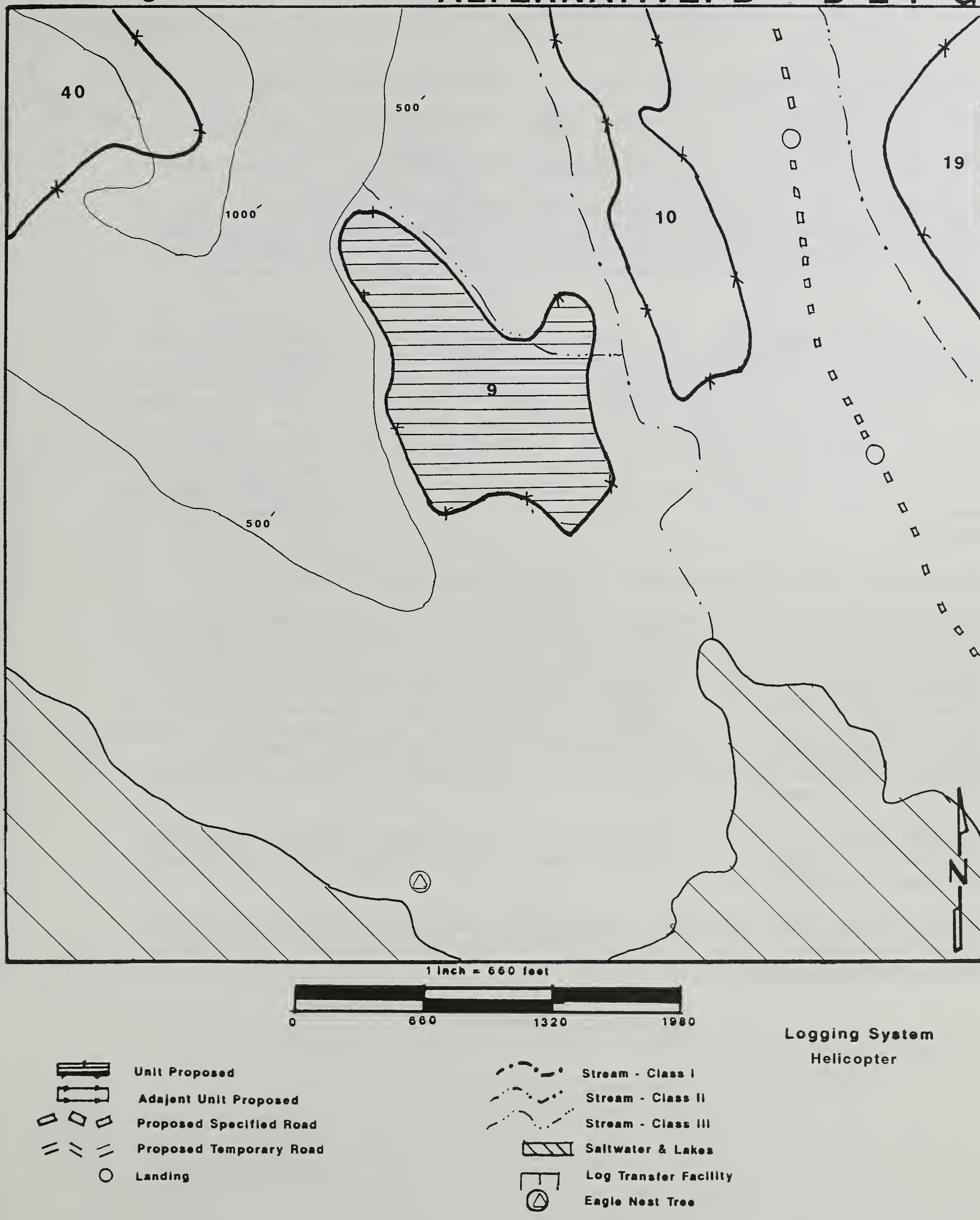
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Red or yellow cedar as only a minor component. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

Prescription: Unit will be managed as an uneven aged stand. Overstory removal will establish natural regeneration with an extended rotation of 120-150 years. Provide an irregularly shaped backline. Depending upon the alternative selected trees less than 12 or 16 inches in diameter will be felled only for safety. Protect stream as required under Section c of timber sale contract and appropriate BMP's. No harvest of timber within 500 feet of the beach or 1,000 feet of the estuary, or within 100 feet of the flood plain on Frank Creek. If alternative B, F,or G is selected leave clumps of trees within the unit. These clumps to be composed of large cull trees and smaller sound trees. Clumps should include 1 to 3 smaller sound trees. Smaller sound trees should have good form and be should be smaller than 24 inches in diameter. Throughout the unit leave as many cull trees standing as safely possible. Provide protection of eagle tree. Other possible treatments include planting, shrub control, precommercial thinning, porcupine control and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. Unit 9 will take two fallers about 25 days to fall and 8 days to yard.

Other Prescriptions Considered. Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting visual objectives.

UNIT 9 ALTERNATIVE: B D E F G



CAMPBELL TIMBER SALE UNIT 10 IN ALTERNATIVES B, D, E, F, G PC

Total Acres 24 Treatment Acres 24 Harvest Acres 14

Patch Cut Harvest Volume 350 Harvest volume class VC5 14 acres

Elevation: 60-220 feet Aspect: West Site Productivity: Mod-High

The plant association is 25% western hemlock/blueberry and 75% western hemlock.

DESCRIPTION: This unit is located in the fresh water influence zone. Unit is located between two class I streams with one to several areas of steep sandy slopes. Frank Creek contain sensitive ravines underlain with fine textured deposits and these areas will be excluded from consideration for harvest patches.

DESIRED FUTURE CONDITION: Short term - Provide high-quality habitat for fish and riparian-associated wildlife species including Vancouver Canada goose nesting habitat, brown bear bedding areas and travel zones for bears and other wildlife. No decline in channel/soil stability. Maintain stable stream banks and a future supply of large woody debris. No measurable decline in water quality. This unit is unseen from the Bradfield Canal and would be seen from Frank Creek. Little change of the visual character of the fresh water influence zone. Texture change and form shape will not be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

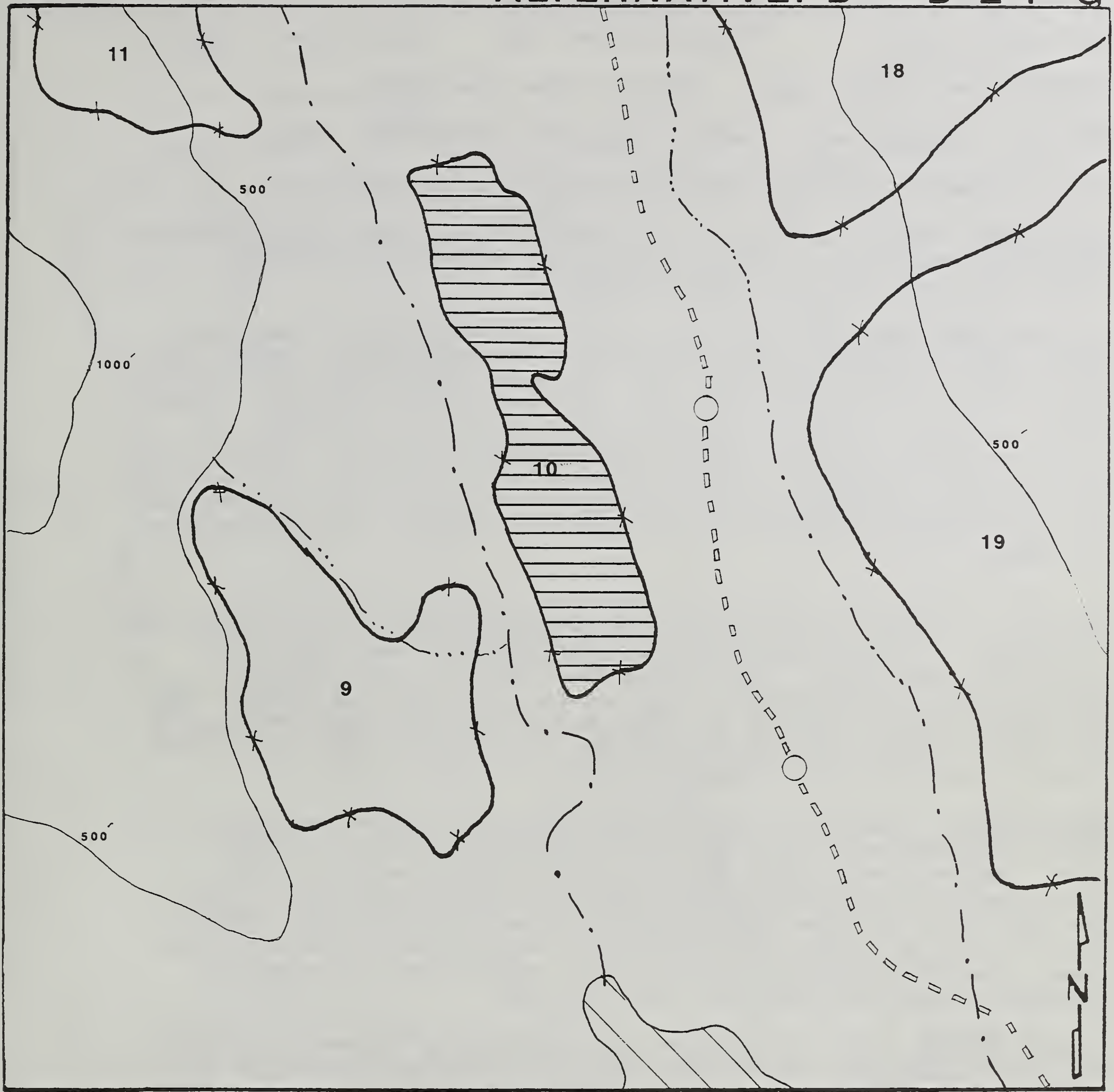
Long term - Increase productivity for sawlogs and higher value products.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven aged stand with an extended rotation of 120-150 years. Harvest 2-5 groups approximately 3-6 acres in size, and harvest trees less 12 inches in diameter only for safety. Groups to be located on benches and more stable areas of unit. No harvest of timber within 1,000 feet of the estuary, or within 100 feet of the flood plain for Frank Creek. Ensure protection of eagle tree. Leave as main cull trees standing as safely possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Harvest will take two fallers approximately 12 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED. Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection.

UNIT 10 ALTERNATIVE: B D E F G



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 11 IN ALTERNATIVES B, E, F, G 12" OSR/w/LT

Total Acres 13 Treatment Acres 13 Harvest Acres 13

12" OSR Harvest Volume 325 Harvest volume class VC5 13

Elevation: 350-800 feet Aspect: East Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the upland interior zone. Unit is located above Frank Creek a class I stream. Frank Creek basin contains sensitive ravines underlain with fine textured deposits.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of large forest blocks, maintain wildlife travel corridors to adjacent drainages, harvest units mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Frank Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

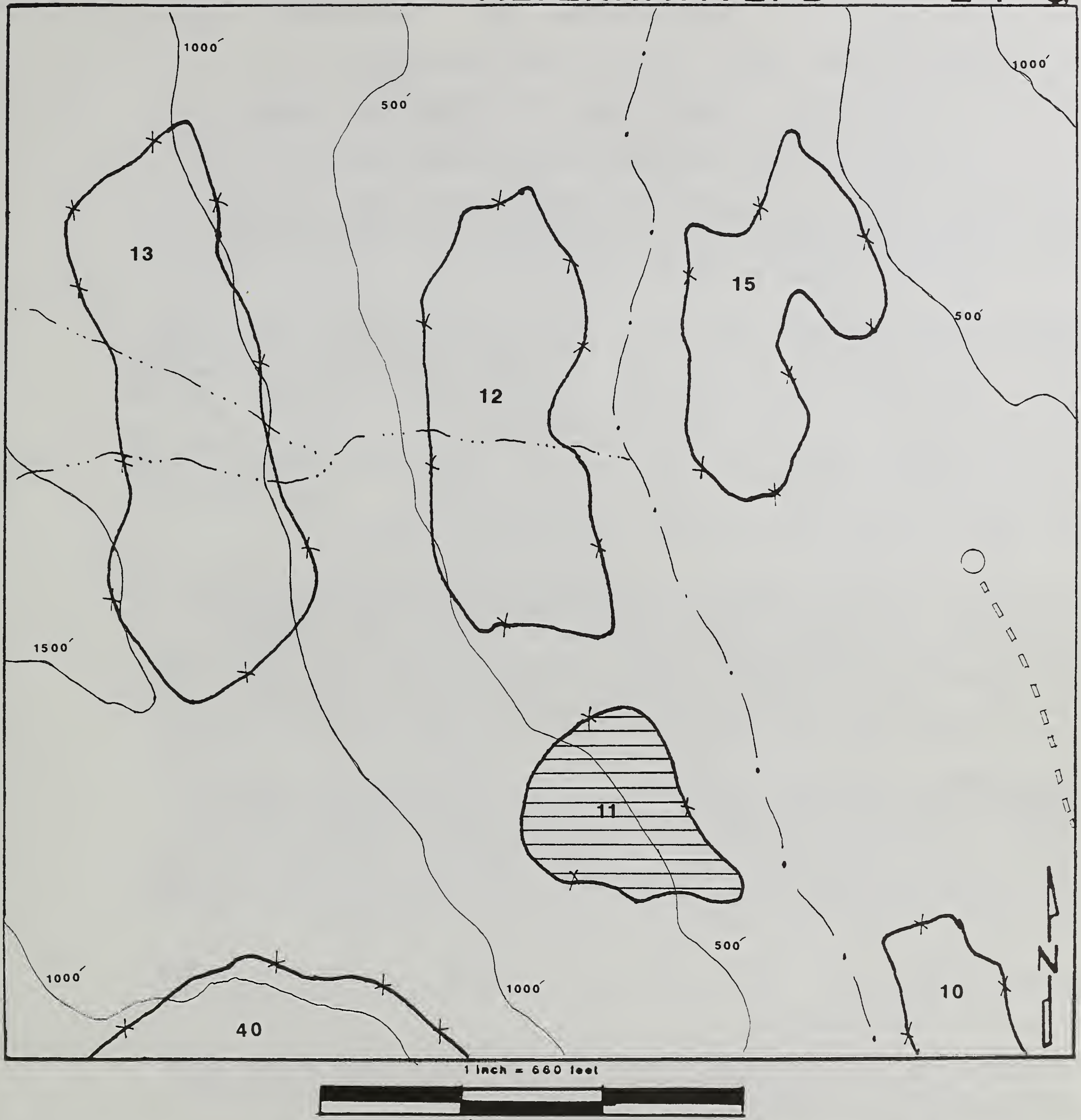
Long term - Retain some large trees for genetic, visual and structural diversity. Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Red or yellow cedar as only a minor component. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years. No decline in slope stability.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven-aged stand multi-story stand with an extended rotation of 120-150 years. Harvest trees smaller than 12 inches in diameter only for safety. Directional fall trees away from any class III stream on south edge of unit. Use slope break above the channel to the south as the unit boundary BMP's 13.2, E3; 13.3 E3. Maintain minimum 100 foot buffer from floodplain of Frank Creek. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 11 will take two fallers approximately 11 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 11 — ALTERNATIVE: B E F G



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 12 IN ALTERNATIVES B, E, F, G 12" OSR/w/LT

Total Acres 30 Treatment Acres 30 Harvest Acres 30

12" OSR Harvest Volume 650 Harvest volume class VC6 30

Elevation: 100-530 feet Aspect: East Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the upland interior zone. Unit is located above Frank Creek a class I stream. Frank Creek basin contains sensitive ravines underlain with fine textured deposits. There is a class III stream that flows through the middle of the unit.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of large forest block, maintain wildlife travel corridors to adjacent drainages, harvest units mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Franks Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view.
Unit will regenerate naturally with a predominance of hemlock.

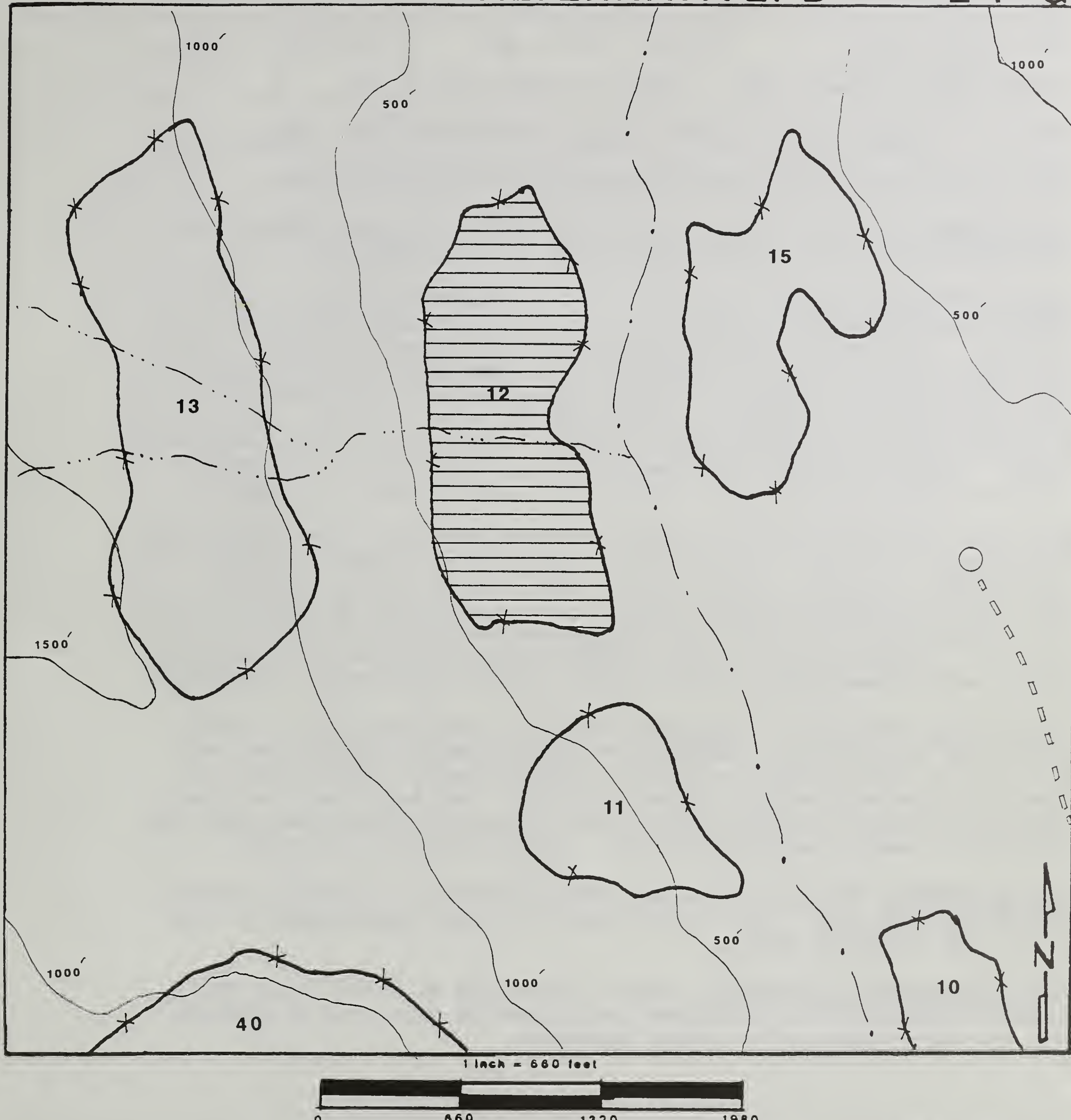
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Red or yellow cedar as only a minor component. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years. Retain some large trees for genetic, visual and structural diversity.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Provide Class c stream protection in timber sale contract. Leave 1-8 larger trees per acre along the east boundary. Vary back line to make west boundary not appear straight from saltwater. Leave as many cull trees standing as safely possible. Maintain minimum 100 foot buffer from floodplain of Frank Creek.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 12 will take two fallers approximately 22 days to fall and 7 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 12 ALTERNATIVE: B E F G



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE   UNIT 13 IN ALTERNATIVES B, E, F, G 12" OSR/w/LT

Total Acres 40   Treatment Acres 40   Harvest Acres 40

12" OSR Harvest Volume 972   Harvest volume class VC6 40

Elevation: 1,000-1,600 feet Aspect: East Site Productivity: High

Plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the upland interior zone. Unit has two class III stream located approximately in the middle of the unit.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of wildlife travel corridors to adjacent drainages, harvest units mimic natural vegetative patterns. Provide for wildlife movement from top to bottom of unit. Unit will appear natural from the Bradfield canal. From Franks Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Red or yellow cedar as only a minor component. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years. Retain some large trees for genetic, visual and structural diversity.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Trees smaller than 12 inches will be cut only for safety. Directional fall trees away from any class III streams (see map). Vary back line to make west boundary not appear straight from saltwater. Directional fall trees away from corridors or remove slash from corridor. Provide protection for goats.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 13 will take two fallers approximately 33 days to fall and 10 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 13 ALTERNATIVE: B E F G

1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 14 IN ALTERNATIVES B, E, F, G 12" OSR/w/LT

Total Acres 73 Treatment Acres 73 Harvest Acres 73

12" OSR Harvest Volume 1,512 Harvest volume class VC5 73

Elevation: 50-750 feet Aspect: East Site Productivity: Mod

Plant association is 18% western hemlock/blueberry and 82% western hemlock-Alaska cedar/blueberry.

DESCRIPTION: This unit is located in the upland interior zone. Unit is located above Frank Creek, a class I stream. Stream flowing through unit will be given class II protection as required in timber sale contract. For stream in west northwest portion of unit no anticipated water quality concerns.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of large forest blocks and maintain wildlife travel corridors to adjacent drainages, and harvest units should mimic natural vegetative patterns. Unit appears natural from the Bradfield canal. From Frank Creek visitors will see a more modified landscape. Provide goose nesting and brood rearing habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view.

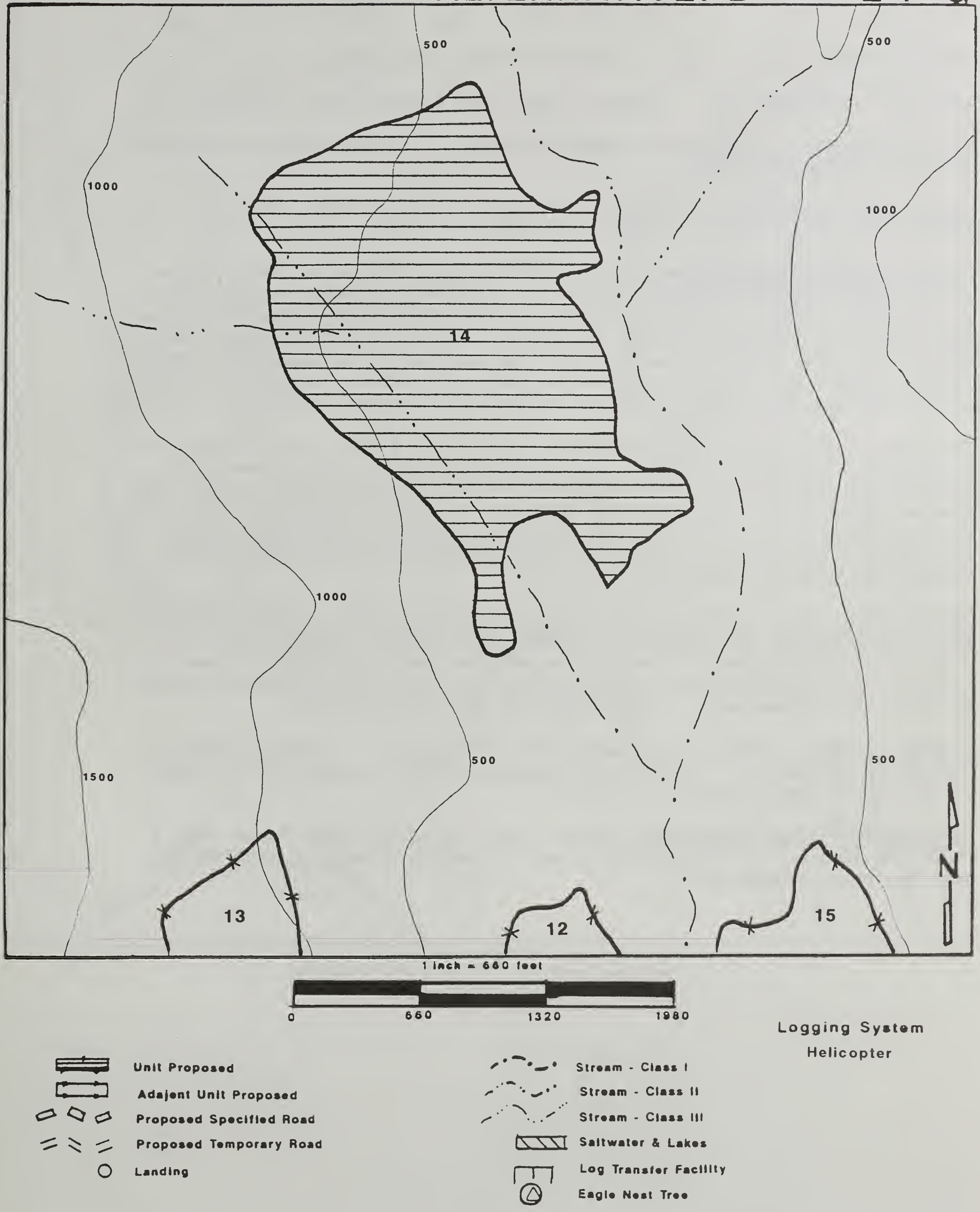
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years. Retain some large trees for genetic, visual and structural diversity. Provide buffer as needed to protect Class I stream in southeast tip of unit and this buffer may be greater than 100 feet.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years and multi-storied stand. Harvest trees smaller than 12 inches in diameter only for safety. Provide section c protection for class III stream. Leave 1-8 larger trees per acre along the east boundary in clumps and leave as many cull trees standing throughout the unit as safely possible. In south southeast portion of unit stream crosses landform with alluvial bank control (see map).BMP's 13.2 E3; 13.3 E3.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 14 will take two fallers approximately 51 days to fall and 16 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 14 ALTERNATIVE: B E F G



CAMPBELL TIMBER SALE UNIT 15 IN ALTERNATIVES B, E, F, G 12" OSR/w/LT

Total Acres 20 Treatment Acres 20 Harvest Acres 20

12" OSR Harvest Volume 399 Harvest volume class VC5 20

Elevation: 50-350 feet Aspect: West Site Productivity: Mod-High

Plant association is 85% western hemlock/blueberry/spinulose shield fern and 15 % western hemlock/blueberry.

DESCRIPTION: This unit is located in the upland interior zone. Unit is located above Frank Creek, a class I stream.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. harvest units should mimic natural vegetative patterns. From Frank Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view.

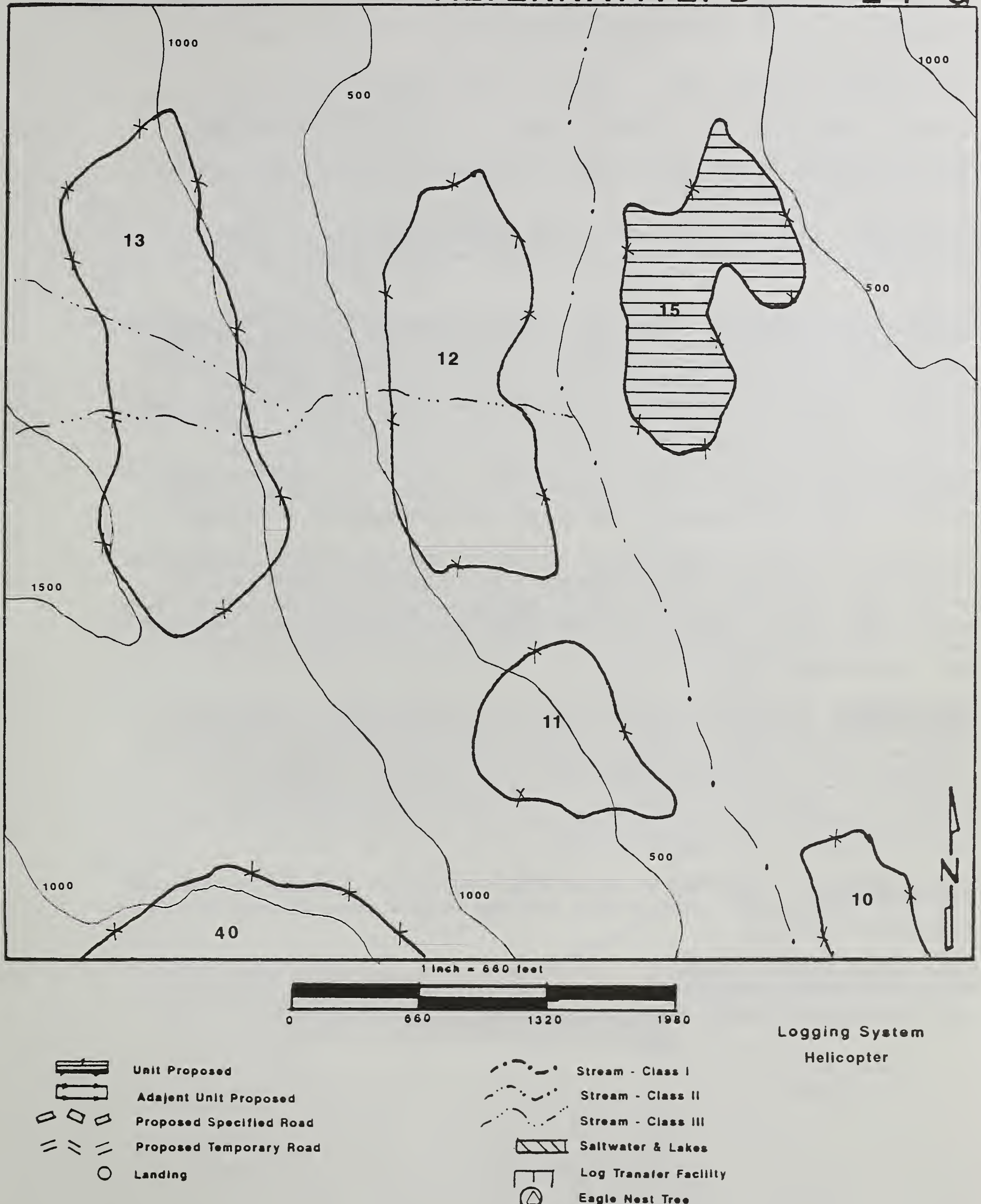
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years. Retain some large trees for genetic, visual and structural diversity.

PRESCRIPTION: Unit will be managed as an uneven-aged stand. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Leave 1-8 larger trees per acre along the west boundary with clumps of other cull trees. Leave culls where possible in unit. Maintain 100 minimum buffer from Frank Creek floodplain boundary.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 15 will take two fallers approximately 14 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection.

UNIT 15 ALTERNATIVE: B E F G



Logging System
Helicopter

CAMPBELL TIMBER SALE UNIT 16 IN ALTERNATIVES B, E, F, G 16" OSR/w/LT

Total Acres 32 Treatment Acres 32 Harvest Acres 32

16" OSR Harvest Volume 800 Harvest volume class VC5 32

Elevation: 450-1,300 feet Aspect: West Site Productivity: Mod-High

Plant association is 44% western hemlock/blueberry/spinulose shield fern and 56% western hemlock/blueberry.

DESCRIPTION: This unit is located in the upland interior zone. There is a small stream in the southern part of the unit and no water quality concerns are anticipated.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forested blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Franks Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

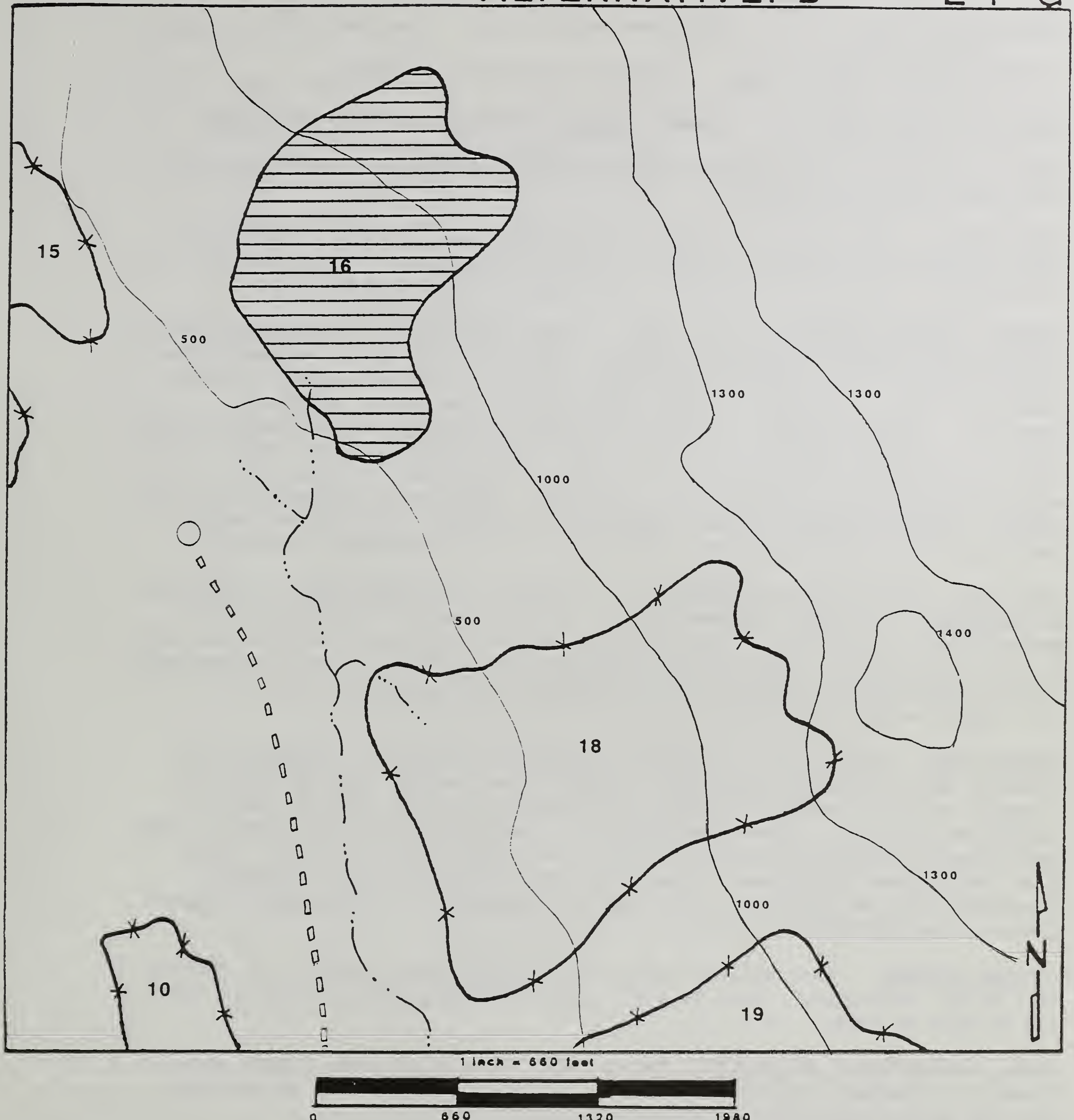
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Directional fall trees away from class III stream. Vary back line to make east boundary not appear straight from saltwater. Retain some large trees for genetic, visual and structural diversity. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 16 will take two fallers about 27 days to fall and 8 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 16 ALTERNATIVE: B E F G



Logging System
Helicopter

	Unit Proposed		Stream - Class I
	Adajent Unit Proposed		Stream - Class II
	Proposed Specified Road		Stream - Class III
	Proposed Temporary Road		Saltwater & Lakes
	Landing		Log Transfer Facility
			Eagle Nest Tree

CAMPBELL TIMBER SALE   UNIT 18   IN ALTERNATIVES B, E, F, G 16" OSR/w/LT

Total Acres 55   Treatment Acres 55   Harvest Acres 55

16" OSR Harvest Volume 1,404   Harvest volume class VC5 55

Elevation: 300-1,250 feet   Aspect: West Site Productivity: Mod-High

Plant association is 36% western hemlock/blueberry/spinulose shield fern and 64% western hemlock/blueberry.

DESCRIPTION: This unit is located in the upland interior zone. There is a small stream in the western tip of the unit and no water quality concerns are anticipated. There is a class II stream about 100 west of the unit.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forested blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Franks Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

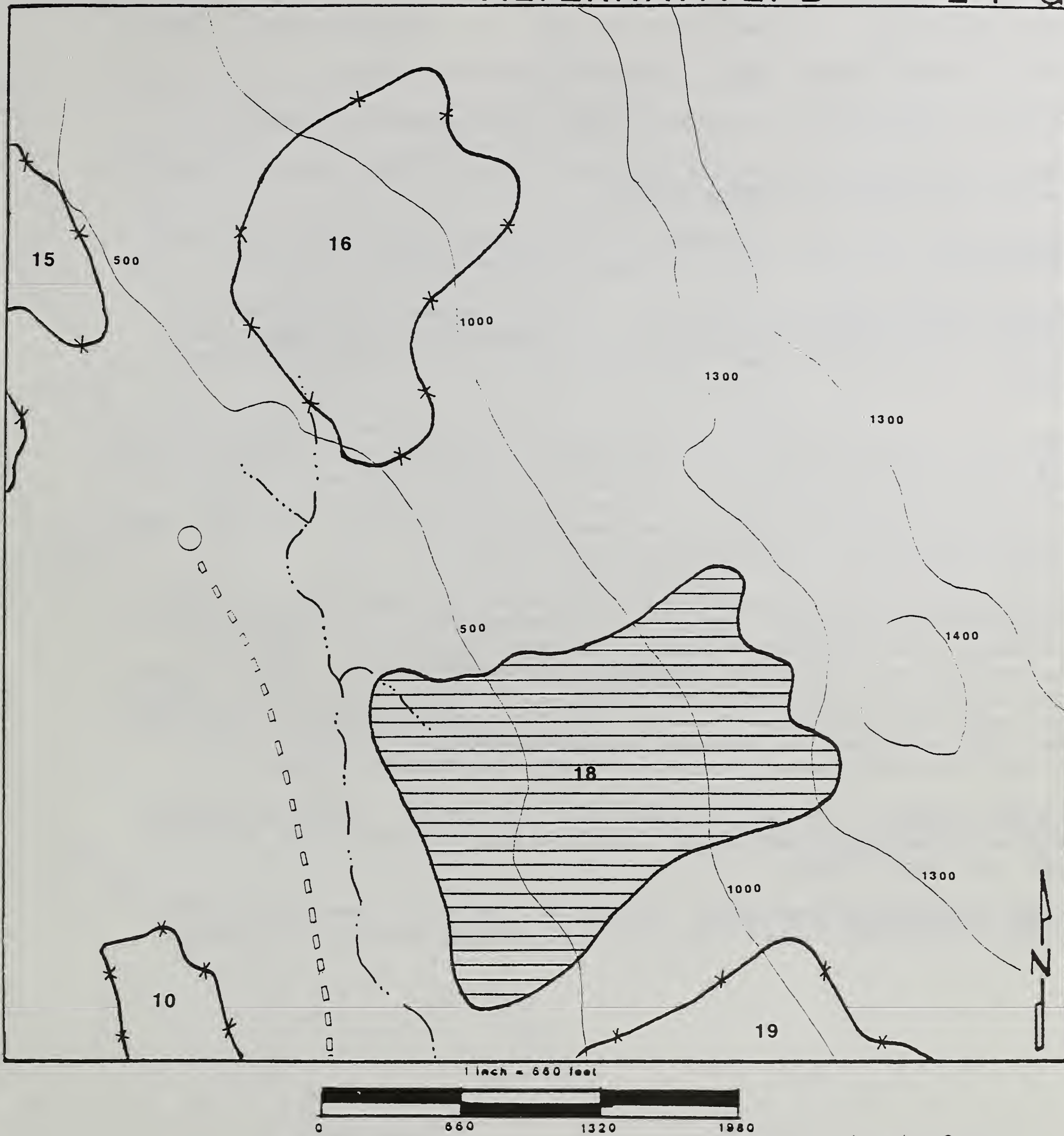
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. No harvest of trees within 100 feet of class II stream west of unit. Directional fall trees away from class III stream. Vary back line to make east boundary not appear straight from saltwater. Retain some large trees for genetic, visual and structural diversity. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 18 will take two fallers about 47 days to fall and 14 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 18 ALTERNATIVE: B E F G



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 19 IN ALTERNATIVES B, E, F, G 12" PC

Total Acres 111 Treatment Acres 111 Harvest Acres 30

12" PC Harvest Volume 660 Harvest volume class VC5 30

Elevation: 350-1,250 feet Aspect: West Site Productivity: High

Plant association is 97% western hemlock/blueberry/spinulose shield fern and 3% western hemlock/blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the saltwater facing zone. Unit is at least 330 feet east of a Class I stream. No other streams in the unit.

DESIRED FUTURE CONDITION: Short term - Unit will appear to have a texture change. Healthy vigorous grows stand of predominately western hemlock is expected. Straight lines and large opening will not be visible from salt water.

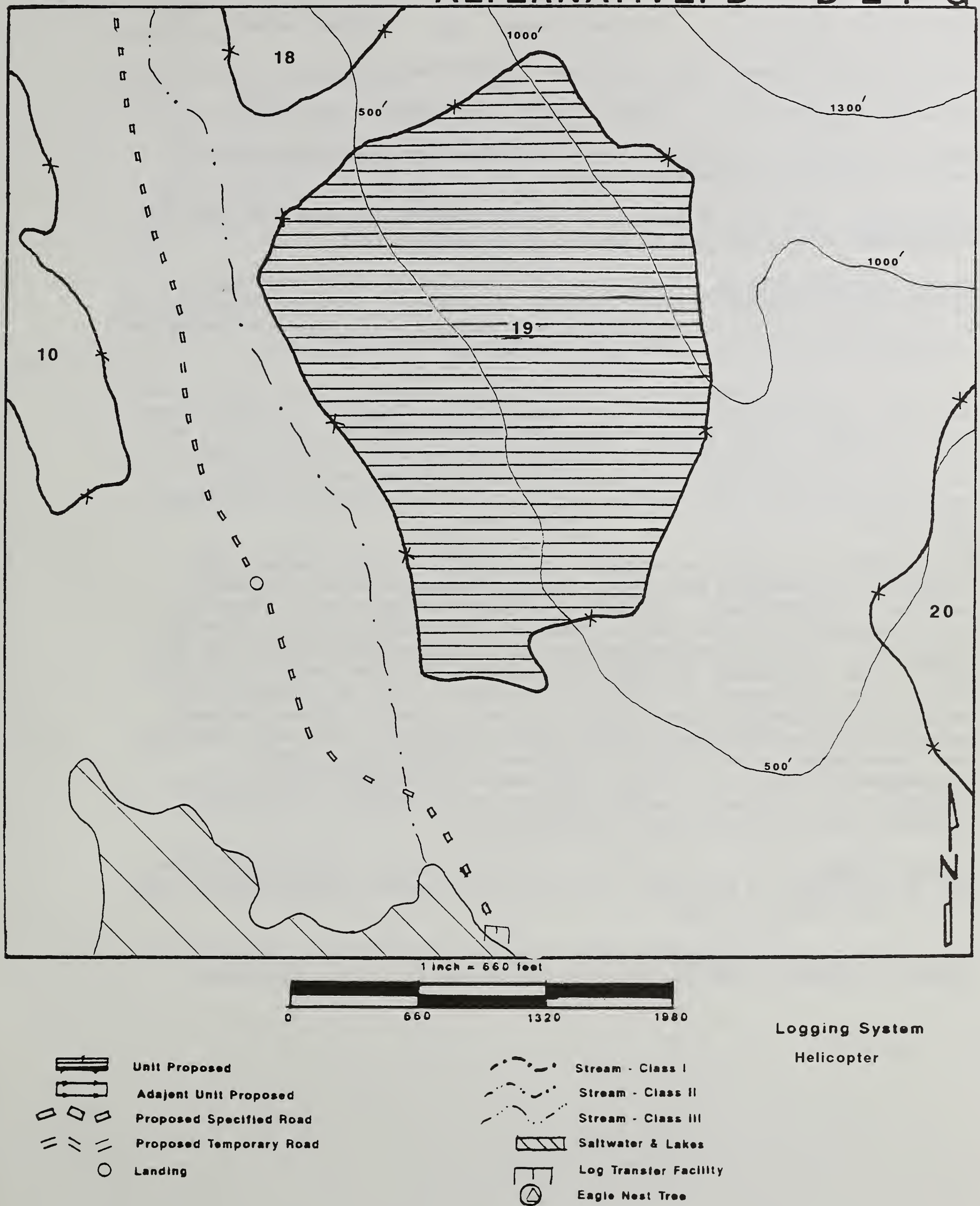
Long term - Stand will have numerous cull trees available for future snags. Increase productivity for sawlogs and higher value products is expected. Group selection will provide for 40% of unit to be harvest in patches 8-10 acres in size. Unit will have a mix of tree sizes and vertical structure and will provide for snow interception sooner than harvest to 9 inches. Tops and limbs should return to pre-logging conditions 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Patch cut will harvest 40% of the stand for harvest in patches from 8-10 acres in size to establish regeneration. Within the patches cut trees smaller than 12 inches in diameter only for safety. Patches will be located on the benches and will stay off the unsuitable land. Leave as many cull trees standing as possible, locate all patch boundaries at least 100 feet from the stream and avoid the sand/silt slopes for harvest. Provide a stand with trees in several age classes with a multi-storied canopy.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. Unit 19 will take approximately 22 days to fall and 7 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 19 ALTERNATIVE: B D E F G



Logging System

Helicopter

CAMPBELL TIMBER SALE UNIT 20 IN ALTERNATIVES B, D, E, F, G 16" OSR/w/LT

Total Acres 48 Treatment Acres 48 Harvest Acres 48

16" OSR Harvest Volume 1,092 Treatment Vol cl acres VC6 48

Elevation: 120-480 feet Aspect: East Site Productivity: High

Plant association 83 % western hemlock/blueberry/spinulose shield fern and 17 percent western hemlock/blueberry.

DESCRIPTION: This unit is located in the saltwater facing zone. A class III stream forks in the unit and is located in the eastern half.

DESIRED FUTURE CONDITION: Short term - For 15-25 years units will appear natural form the Bradfield Canal with a texture change. Straight lines and large openings will not be visible from saltwater. Healthy vigorous growing new stand will be mostly western hemlock. No decrease in water quality.

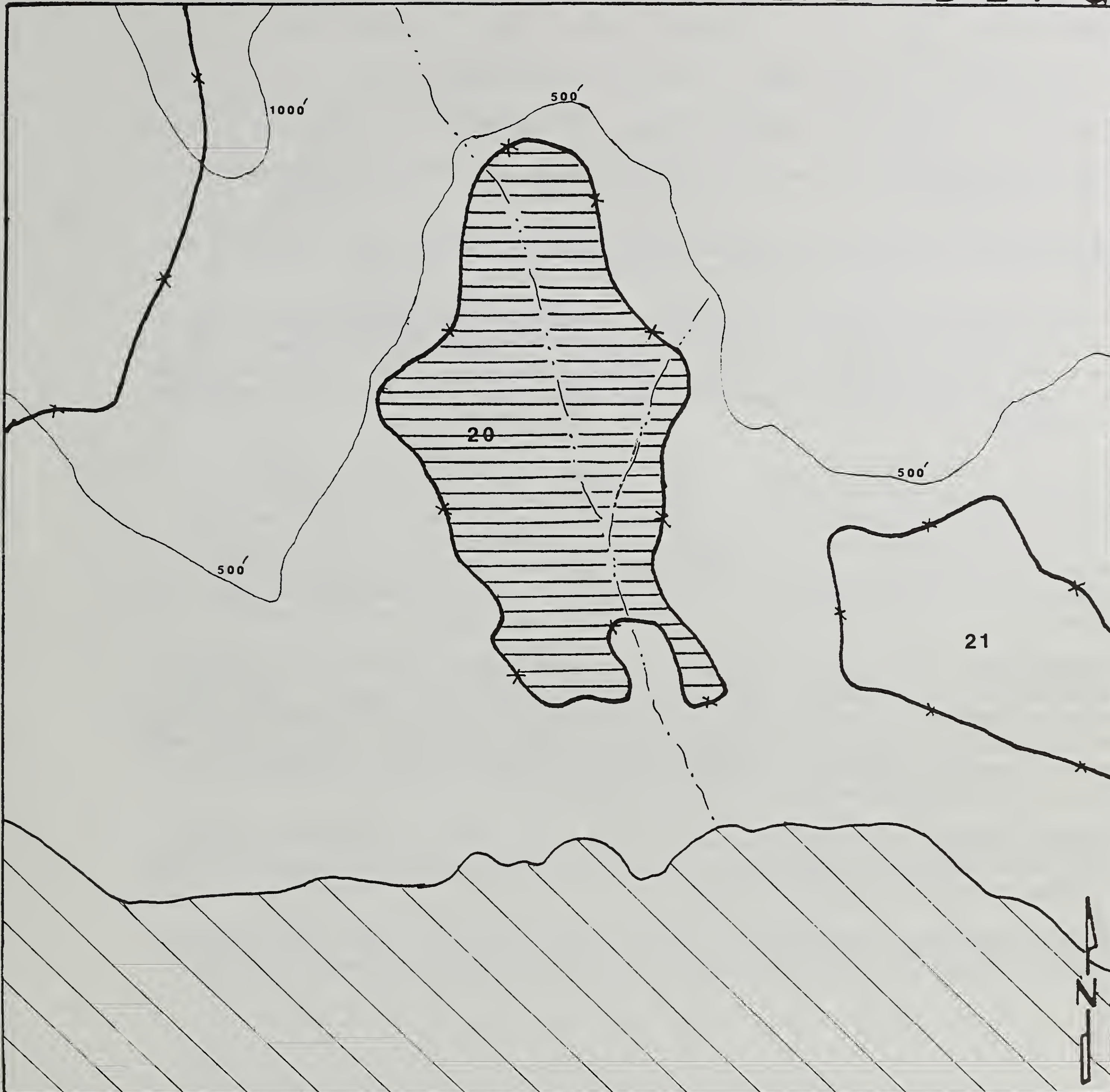
Long term - Western hemlock will be most numerous tree with some Sitka spruce and a few scatter Alaska yellow cedar trees could be found in a multi-storied stand over time. Stand will be have trees in several age classes. Unit will provide value to wildlife for snow interception range sooner that harvest to 9 inch tree size. Slash from tops and limbs should return to pre-logging conditions in 20-30 years. Buffers can provide future source of wood debris for stream.

PRESCRIPTION: Unit will be managed as an uneven-aged stand. Harvest the overstory to establish a new stand. Area to be managed with an extended rotation of 120-150 years. Provide an irregularly shaped unit. Trees less than 16 inches in diameter will be felled only for safety. Follow contract clause C6.51, Section c for Streamcourse protection and BMPS 13.16, E10, E11 and 13.16 E5. No harvest of timber within 500 feet of the beach, or 100 feet of the class III stream. If the overstory removal limit is 12 inches leave additional trees larger than 12 inches to ensure visual condition and snow interception is accomplished. Leave trees in clumps and leave fall only those cull trees needed to work safely in the area. Natural regeneration, predominantly hemlock is expected. Precommercial thinning in 20-30 years. Possible future treatments include planting, shrub control, precommercial thinning, porcupine control and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. Unit 20 will take two fallers about 37 days to fall and 11 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This was rejected for not meeting visual objectives.

UNIT 20 ALTERNATIVE: B D E F G



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE   UNIT 21   IN ALTERNATIVES D, E   16" OSR

Total Acres 25   Treatment Acres 25   Harvest Acres 25

16" OSR Harvest Volume 529   Harvest volume class VC5 25

Elevation: 180-300 feet Aspect: East   Site Productivity: 50% low & 50% mod

Plant association is 47% western hemlock/cliffs and 53% western hemlock-Alaska cedar/blueberry .

DESCRIPTION: This unit is located in the saltwater facing zone. There is an eagle tree about 500 feet south of the unit.

DESIRED FUTURE CONDITION: Short term - Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. Texture change from the surrounding areas will be visible. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock.

Long term - Increase productivity for sawlogs and higher value products. Species mix of western hemlock, Alaska yellow cedar and Sitka spruce with a mutli-storied stand structure is desired over time. Some of the trees left will release and should have enhanced value in the future. Unit is expected to regenerate naturally, predominantly with hemlock. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Tops and limbs should return to conditions similar to pre-logging in 20-30 years.

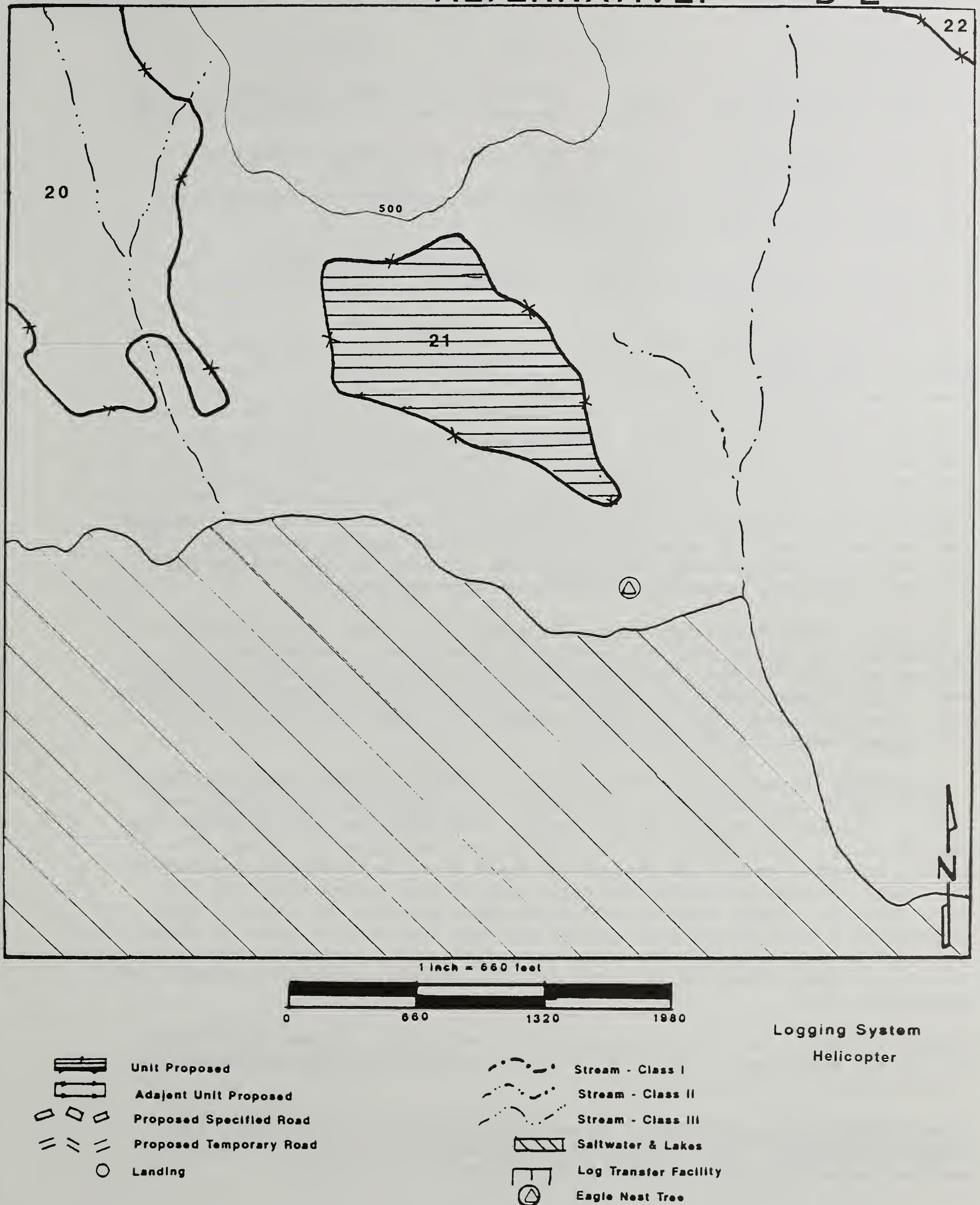
PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Unit will appear irregularly shaped. Trees less than 16 inches in diameter will be felled only for safety. Throughout the rest of the unit leave as many standing culls as safely possible. Protect the eagle tree. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. Unit 21 will take two fallers approximately 18 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 21

ALTERNATIVE: D E



Logging System
Helicopter

CAMPBELL TIMBER SALE   UNIT 22   IN ALTERNATIVES D,   16" OSR
IN ALTERNATIVES E   12" OSR/w/LT

Total Acres 37   Treatment Acres 37   Harvest Acres 37

16" OSR Harvest Volume 840   Harvest volume class VC4 32 ac VC5 5 ac
12" OSR/w/LT Harvest Vol. 910   Harvest volume class VC4 32 ac VC5 5 ac

Elevation: 100-400 feet   Aspect: East   Site Productivity: Mod-High

Plant association is 19% western hemlock/blueberry/spinulose shield fern and 81% western hemlock-Alaska cedar/blueberry.

DESCRIPTION: This unit is located in the fresh water influence zone. Unit is located in Tom Creek drainage. Unit is visible from a corridor in in the Harding River drainage.

DESIRED FUTURE CONDITION: Short term - Existing poor slope stability creates embedded silty substrate therefore existing habitat is mediocre or marginal. These areas are at risk more so than uncut places. Fish habitat is better, more stable as one goes upstream closer to the unit on westerly stream. Tom Creek has better quality habitat and also is embedded with silty material. Provide Vancouver Canada goose nesting and brood rearing habitat, brown bear bedding areas, channel/soil stability and travel zone for bears and other wildlife. No decline in slope stability. Stable stream banks and a future supply of large woody debris. The stream bed will contain pools with resident and anadromous fish. No measurable decline in water quality standards. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

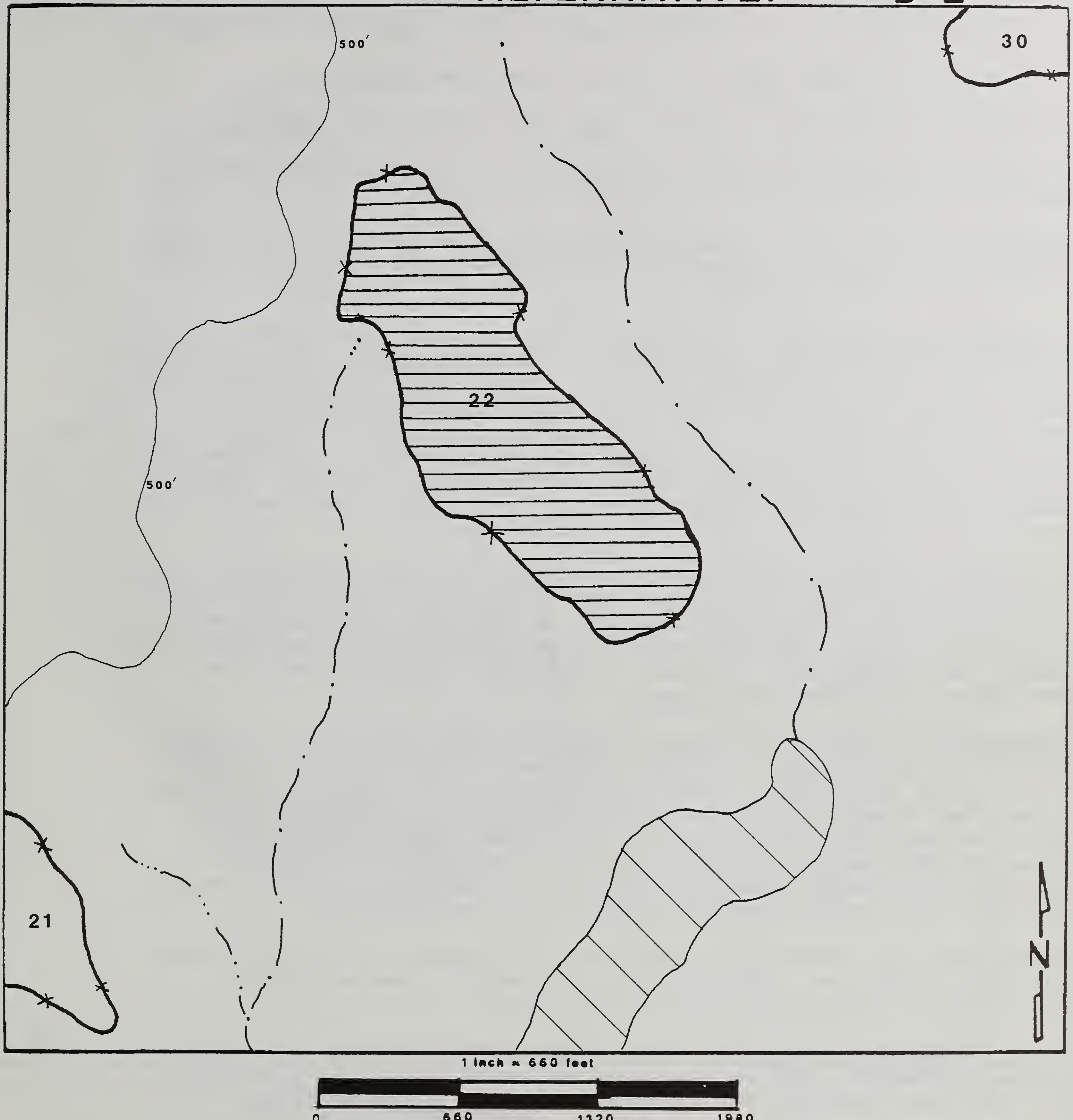
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Depending upon the alternative selected harvest trees smaller than 16" or 12 only for safety. Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Directional fall trees away from any class III stream. No harvest of timber within 100 feet of the class I stream floodplain boundary of Tom Creek. Provide protection for eagle tree if logs yarded direct to salt water (Alt. D). Leave standing cull trees where possible for safety. Under alternative E leave larger poor quality and some food quality trees in clumps for wildlife and to breakup the appearance of the unit. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 22 will take two fallers take approximately 31 weeks to fall and 10 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 22 ALTERNATIVE: D E



Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 23 IN ALTERNATIVES E 12" OSR

Total Acres 22 Treatment Acres 22 Harvest Acres 22

12" OSR Harvest Volume 462 Harvest volume class VC5 22

Elevation: 450-1000 feet Aspect: East Site Productivity: Mod-High

Plant association is 44% western hemlock/blueberry/spinulose shield fern and 56% western hemlock/blueberry.

DESCRIPTION: This unit is located in the interior uplands zone. A class III stream flows through the southern portion of the unit and there is a class III stream about 100 feet west of the unit.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Provide for wildlife movement from top to bottom of unit. Unit will appear natural from the Bradfield canal. From Tom Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

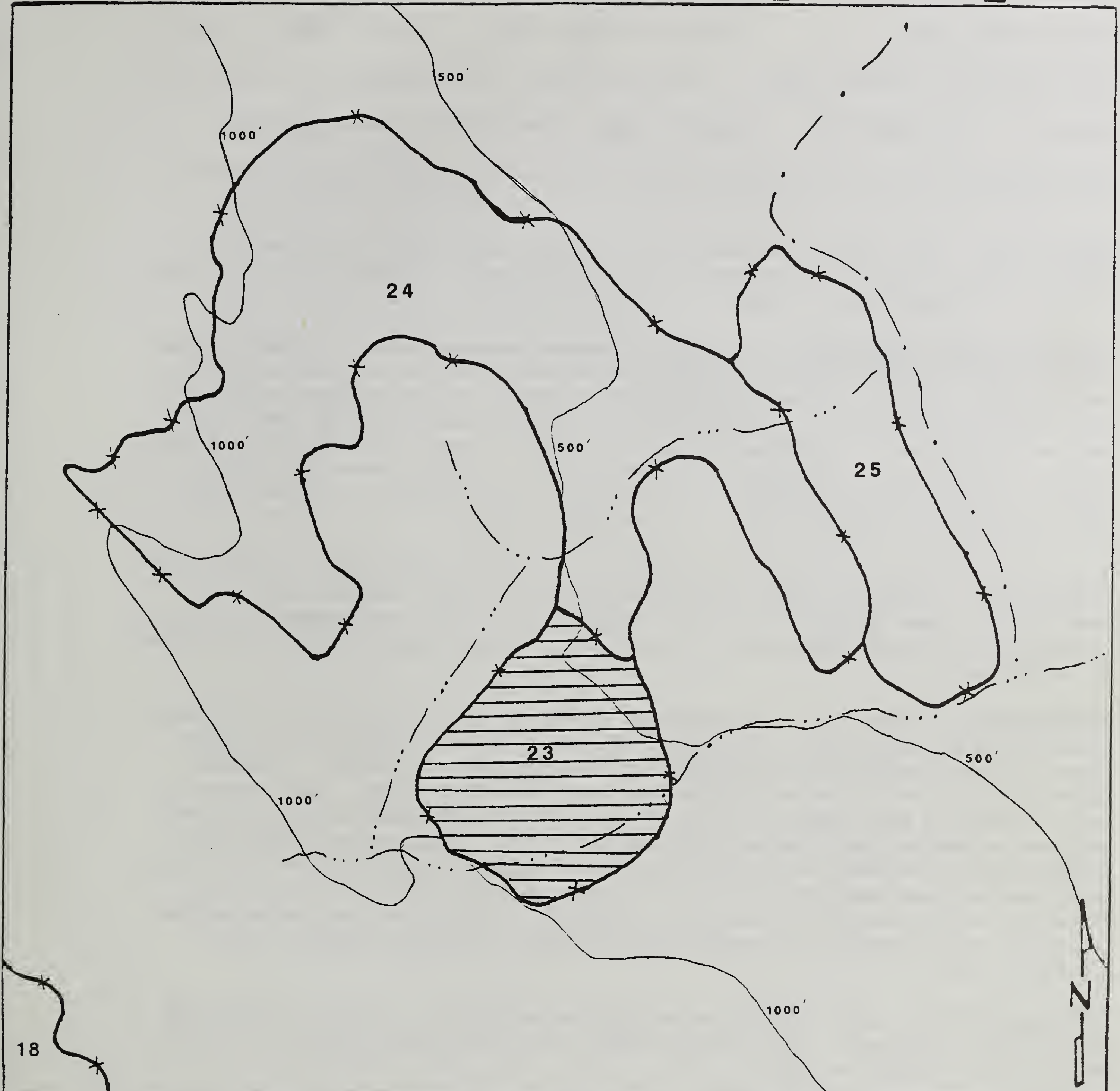
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Vary shape to make west boundary not appear straight from road in Tom Creek drainage. Retain as many cull trees standing as possible and leave several clumps of trees standing scattered throughout the unit for visual and structural diversity for wildlife. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 23 is 18 acres and will take two fallers approximately 15 days to fall and 5 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance and economics.

UNIT 23 ALTERNATIVE: E



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 24 IN ALTERNATIVES E 12" PC

Total Acres 82 Treatment Acres 82 Harvest Acres 40

12" PC Harvest Volume 1,000 Harvest volume class VC5 40

Elevation: 450-1300 feet Aspect: West Site Productivity: Mod-High

Plant association is 76% western hemlock/blueberry/spinulose shield fern and 24% western hemlock/blueberry.

DESCRIPTION: This unit is located in the inland upland zone. A class III stream flows through the southern portion of the unit. Stand borders on units 23 and 25. Stand is steep and frequently dissected.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. From Tom Creek visitors will see a more modified landscape. Provide Vancouver Canada goose nesting and brood habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

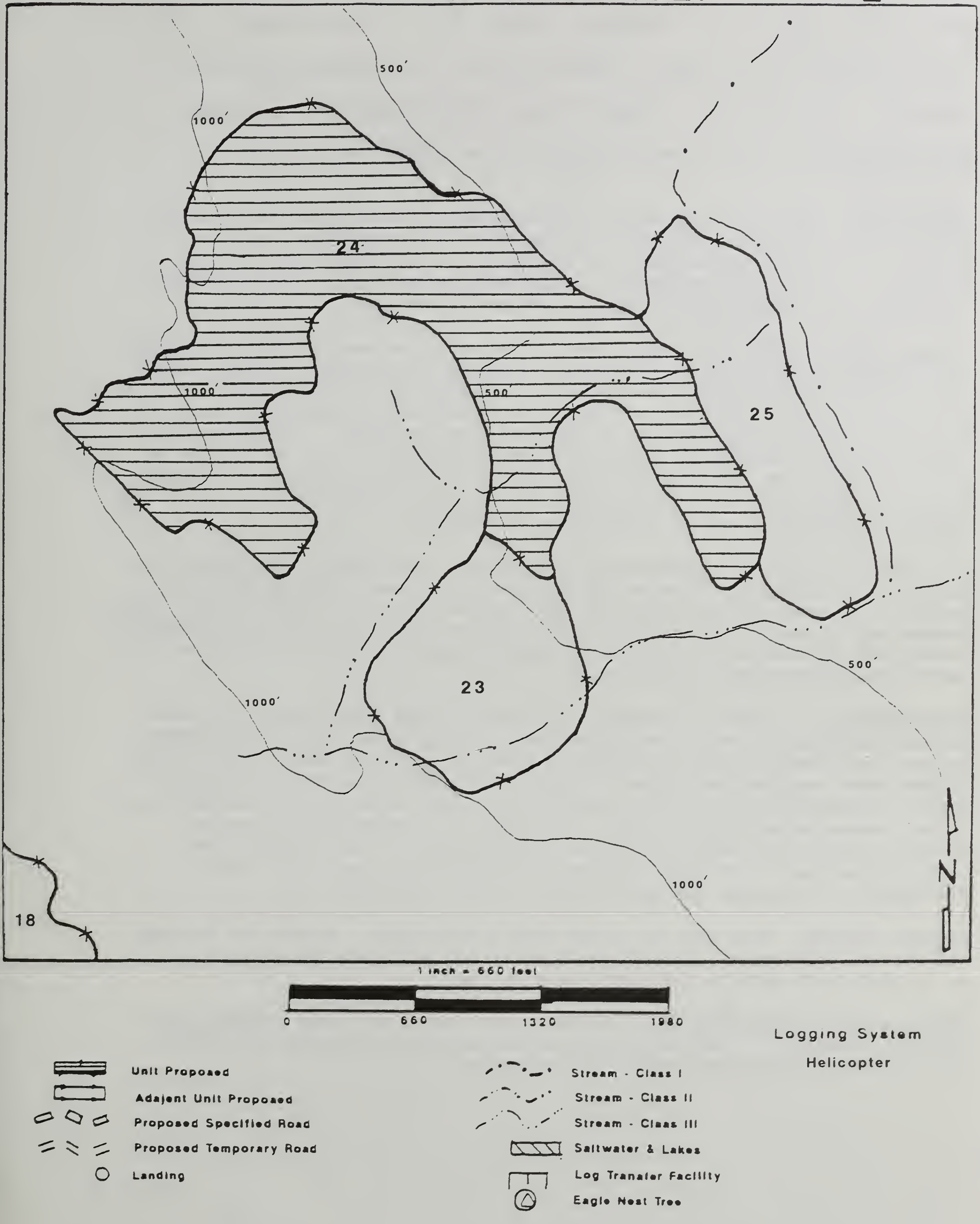
Long Term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Stand will have several different canopy layers with several age classes. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Stand will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Patches harvested will be 5-8 acres in size and total about 40 acres. Vary shape to make boundaries not appear straight from road in Tom Creek drainage. Locate patches on benches and flatter place within stand. Keep top and limbs from patches out of streams and protect stream as required under Section c of timber sale contract and appropriate BMP's. Retain as many cull trees standing as possible for structural diversity for wildlife. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 24 will take two fallers approximately 34 days to fall and 10 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 24 ALTERNATIVE: E



Logging System

Helicopter

CAMPBELL TIMBER SALE   UNIT 25   IN ALTERNATIVES   E   12" OSR

Total Acres 23   Treatment Acres 23   Harvest Acres 23

12" OSR Harvest Volume 440   Harvest volume class VC4 10 ac VC5 13 ac

Elevation: 150-400 feet   Aspect: East   Site Productivity: Mod-High

Plant association is 57% western hemlock-Alaska cedar/blueberry and 43% Mixed-conifer.

DESCRIPTION: This unit is located in the inlands uplands zone. A class III stream flows through the northern portion of the unit and there is a class III stream that is just east of the east boundary and just south of the south boundary. A portion of the channel immediately downstream of confluence of 2 v-nothces is an alluvial fan with raw cut banks (see map).

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Provide for wildlife movement from top to bottom of unit. Unit will appear natural from the Bradfield canal. From Tom Creek visitors will see a more modified landscape. Provide nesting habitat, brown bear bedding areas and channel/soil stability. No decline in slope stability. No measurable decline in water quality standards. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

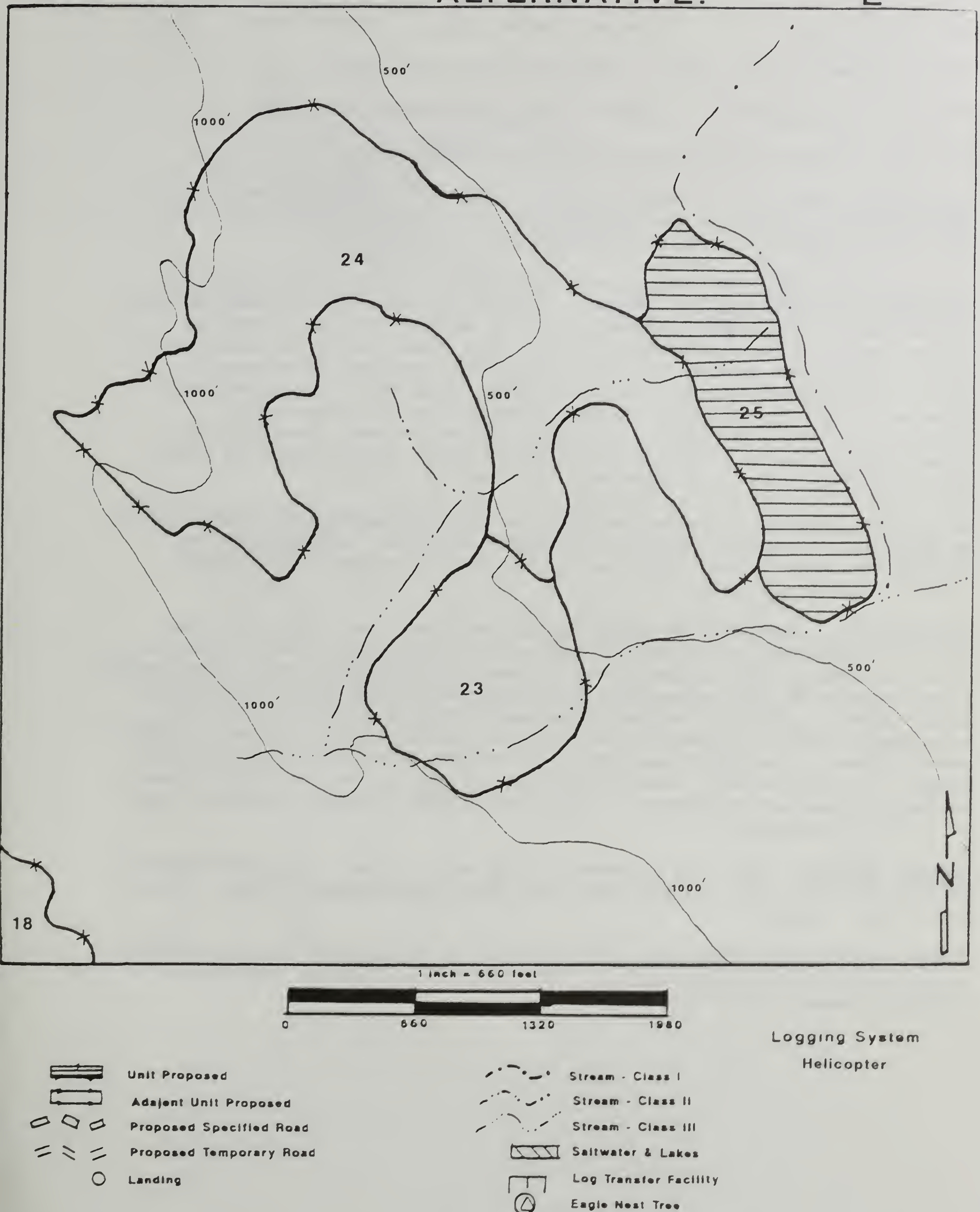
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Vary shape to make west boundary not appear straight from road in Tom Creek drainage. Provide stream protection under section c of timber sale contract and BMP's and do not remove material from stream. Harvest to 12 inches should provide rooting strength and stability to the alluvial soils. Use stream as the boundary (see map). Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by helicopter. Unit 25 is 18 acres and will take two fallers approximately 15 days to fall and 5 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of wildlife, soil and water protection and visual appearance.

UNIT 25 **ALTERNATIVE: E**



CAMPBELL TIMBER SALE UNIT 26 IN ALTERNATIVES E 9" CC

Total Acres 10 Treatment Acres 10 Harvest Acres 10

9" CC Harvest Volume 120 Harvest volume class VC4 10

Elevation: 100-480 feet Aspect: East Site Productivity: Low

Plant association is Mixed-conifer/blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the fresh water influence zone. Unit is above Tom Creek and has a class III stream. The boundary on the west north west side on the unit is above a slope break above Tom Creek.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Stream banks will be stable and there will be a future supply of large woody debris. The stream bead will contain pools with resident and anadromous fish. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture and form change will be visible and will not dominant the view.

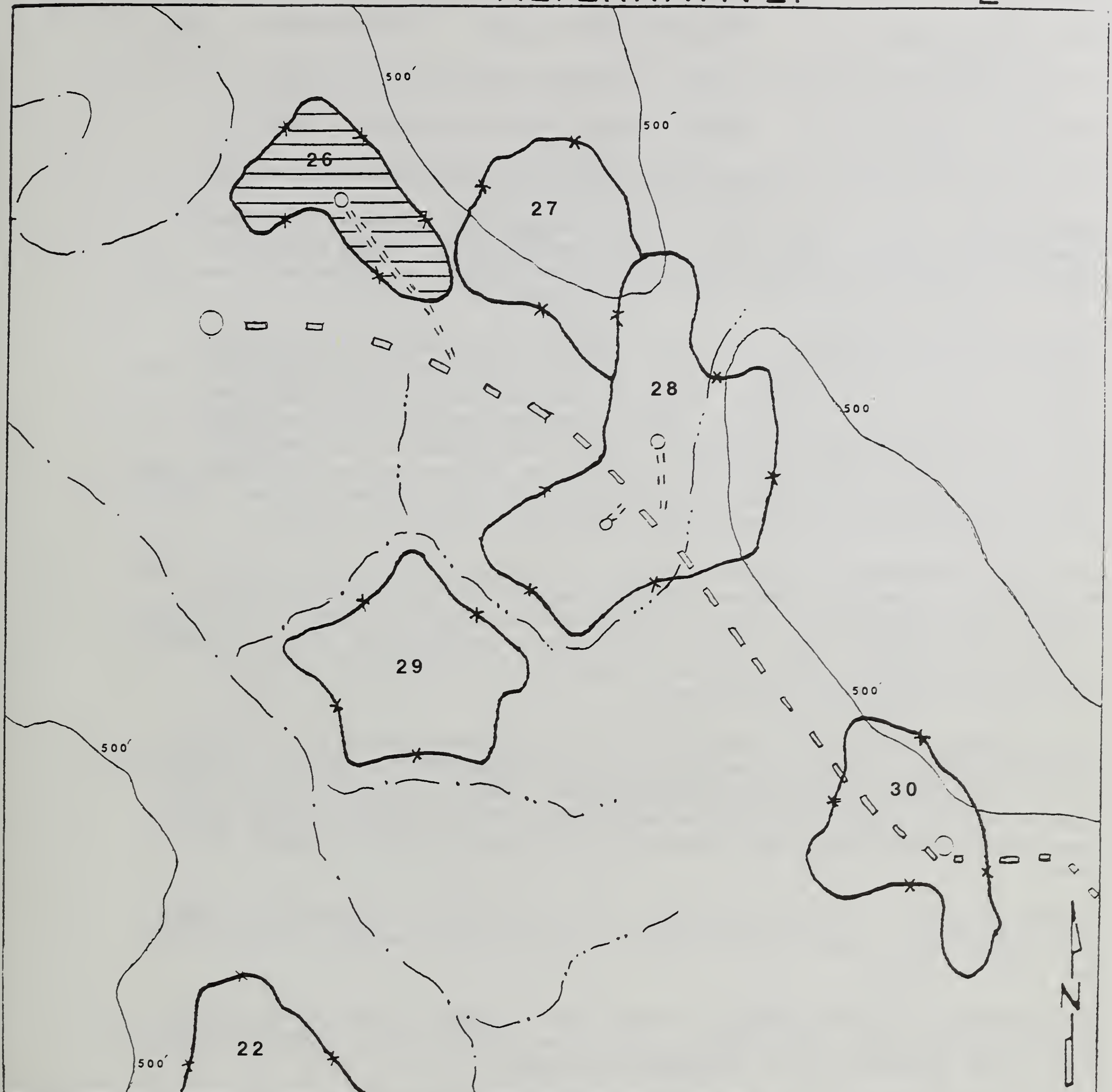
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an even-aged stand. Establish new stand by harvesting the overstory. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave small groups of mixed sized trees along the road to help screen unit from viewpoint located closer to saltwater on the road if possible. Maintain sideslope stability above Tom Creek and streambank stability on small class III water quality stream (see map). Locate west northwest boundary at least 100 feet from Tom Creek and above the slope break into that channel. Partial suspension of logs across the small stream to minimize streambank disturbance. (BMP 13.9) Locate landing to maximize areas of partial suspension.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 26 will take two fallers approximately 4 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. This unit is not feasible for shovel yarding because of soils and slopes.

UNIT 26 ALTERNATIVE: E



1 inch = 660 feet

0 660 1320 1980

Logging System
Highlead

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 27 IN ALTERNATIVES E 12" OSR/w/Ex

Total Acres 13 Treatment Acres 13 Harvest Acres 13

12" OSR/w/Ex Harvest Volume 725 Harvest volume class VC5 13

Elevation: 200-730 feet Aspect: East Site Productivity: High

The plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: This unit is located in the fresh water influence zone and is adjacent to unit 28. There is a small class III stream in the unit that requires no special protection as unit will be helicopter yarded and trees less than 12 inches in diameter will be left standing.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Stable stream banks are expected. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view.

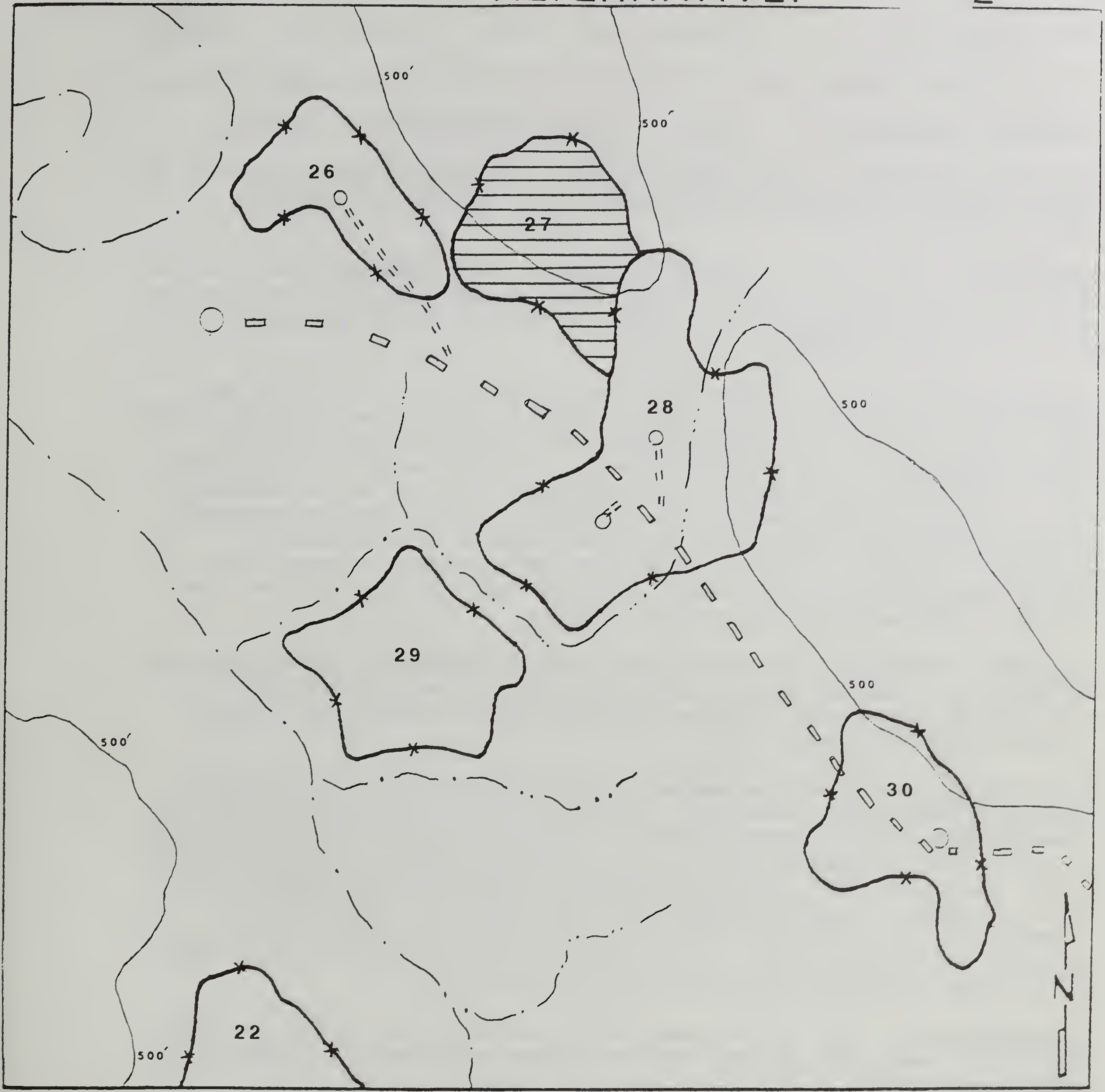
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Harvest all trees larger than 12 inches in diameter using a helicopter to establish regeneration. Leave a strip of uncut trees between unit 26 and 27 and also between 27 and 28 for wildlife travel up and down slope. Directional fall trees away from this corridor or remove any slash.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by road. Unit 27 will take two fallers approximately 7 days to fall and 2 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 27 ALTERNATIVE: E



1 inch = 660 feet

0 660 1320 1980

Logging System
Helicopter

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 28 IN ALTERNATIVES E 9" CC

Total Acres 26 Treatment Acres 520 Harvest Acres 520

9" CC Harvest Volume 520 Harvest volume class VC4 14 ac VC5 12 ac

Elevation: 100-600 feet Aspect: East Site Productivity: Low-Mod

The plant association is 52% western hemlock, 8% western hemlock/blueberry, 36% western hemlock/blueberry/spinulose shield fern, and 4% mixed-conifer/ blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the fresh water influence zone. Unit is above Tom Creek and has a class II stream that flows along the south boundary and a class III stream through the unit. Ravine side slopes are erosive and may become unstable when logged.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Stream banks will be stable and there will be a future supply of large woody debris. The stream bead will contain pools with resident and anadromous fish. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture and form change will be visible and will not dominant the view.

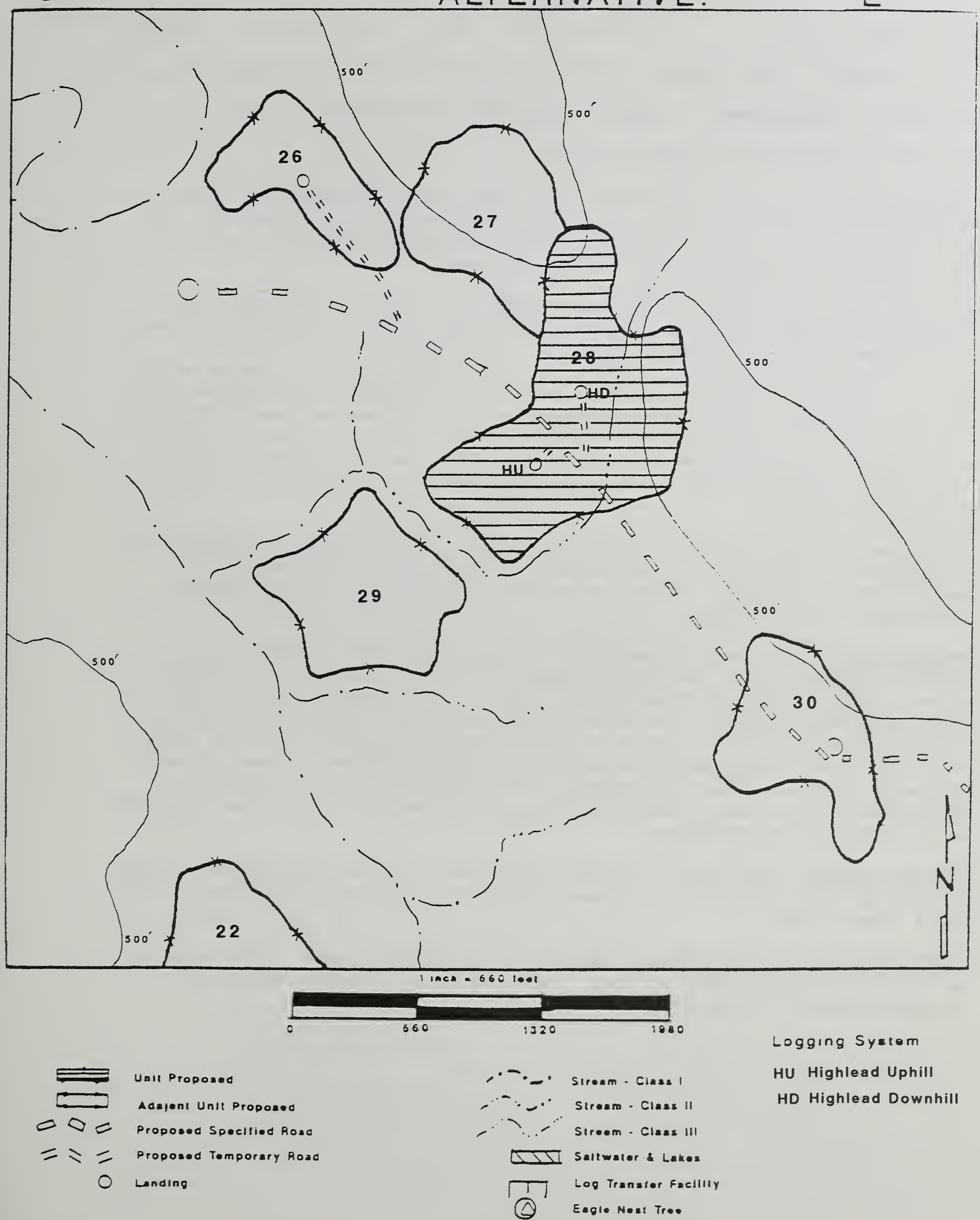
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an even-aged stand. Establish new stand by harvesting the overstory. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave small groups of mixed sized trees along the road to help screen unit from viewpoint located closer to saltwater on the road if possible. Unit is designed to use slope break above the class II as a boundary. Locate boundary above the slope break near west unit boundary BMP's (13.3; 12.6). Directional fall trees into unit to avoid yarding up sideslopes BMP (13.16 E10, 11 and provide partial suspension across small ravine which extends northeast into the unit BMP (13.9).

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 28 will take two fallers approximately 18 days to fall and 14 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. This unit is not feasible for shovel yarding because of soils and slopes.

UNIT 28 ALTERNATIVE: E



CAMPBELL TIMBER SALE UNIT 29 IN ALTERNATIVES E 9" CC

Total Acres 14 Treatment Acres 14 Harvest Acres 14

9" CC Harvest Volume 280 Harvest volume class VC4 2 ac VC5 12 ac

Elevation: 50-180 feet Aspect: East Site Productivity: High

The plant association is western hemlock.

DESCRIPTION: This unit is located in the fresh water influence zone. There is a class II stream east of the unit. This stream turns into a class III. On the north and south side of the unit are streams that will need to have the class determined and appropriate protection applied.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Stream banks will be stable and there will be a future supply of large woody debris. The stream bead will contain pools with resident and anadromous fish. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture and form change will be visible and will not dominant the view.

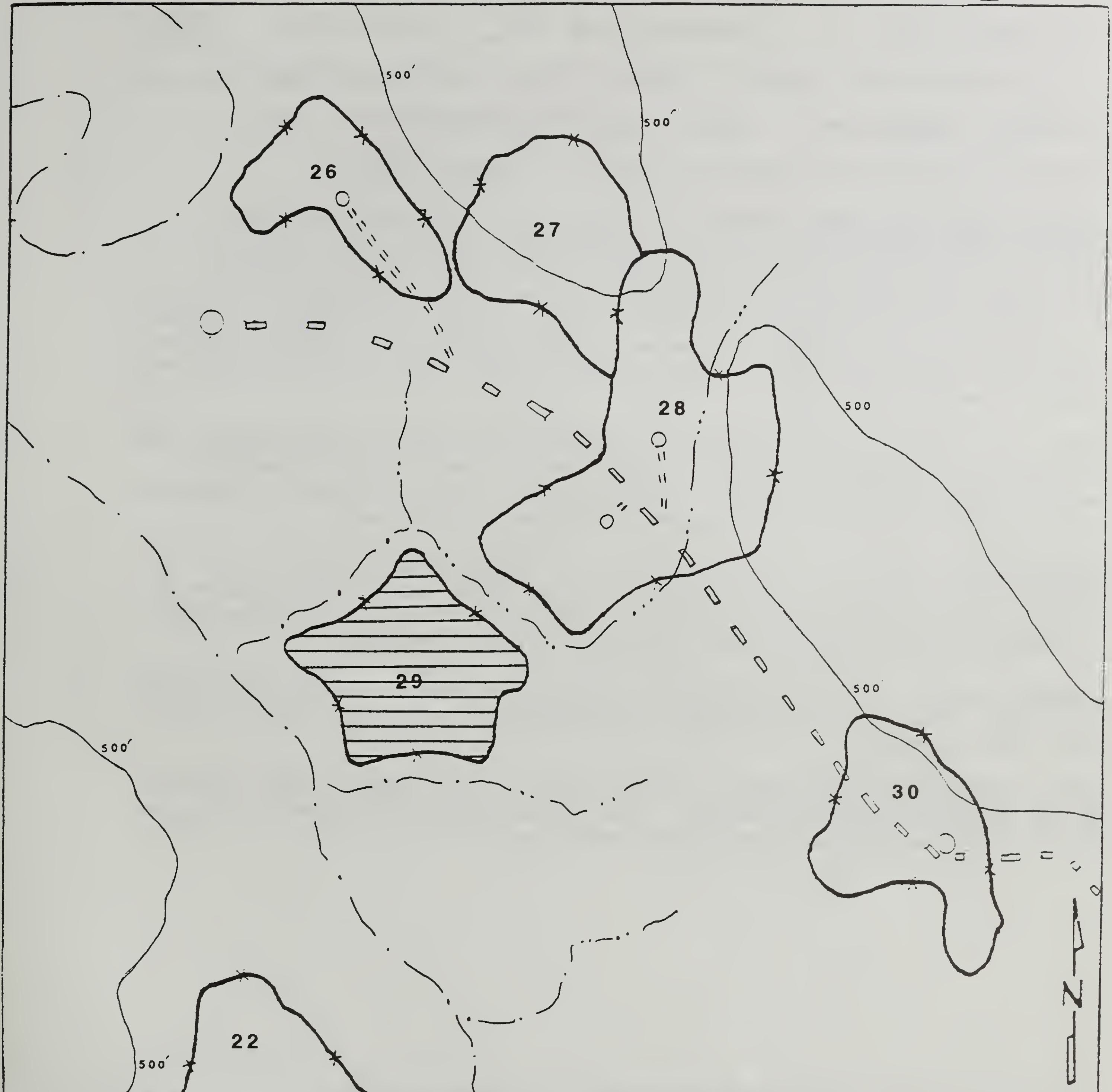
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an even-aged stand. Establish new stand by harvesting the overstory. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave small groups of larger sized trees along west boundary. No harvest of trees within 100 of the class I or class II streams. Unit is designed to use slope break above the class II as a boundary. Ensure full suspension during yarding in northeast corner of unit. This area is above a rearing channel. Sideslopes of ravines in unit are erosive and may be come unstable when logged. Directional fall trees into unit to avoid yarding up sideslopes.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 29 will take two fallers approximately 10 days to fall and 8 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. This unit is not feasible for shovel yarding because of soils and slopes.

UNIT 29 ALTERNATIVE: E

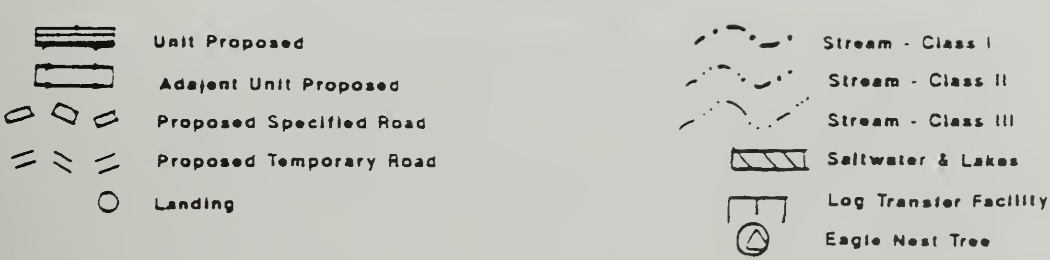


1 inch = 660 feet

0 660 1320 1980

Logging System

Helicopter



CAMPBELL TIMBER SALE UNIT 30 IN ALTERNATIVES E 9" CC

Total Acres 12 Treatment Acres 12 Harvest Acres 12

9" CC Harvest Volume 192 Harvest volume class VC4 2 ac VC5 12 ac

Elevation: 250-600 feet Aspect: East Site Productivity: Low

The plant association is mixed-conifer/blueberry/skunk cabbage.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view.

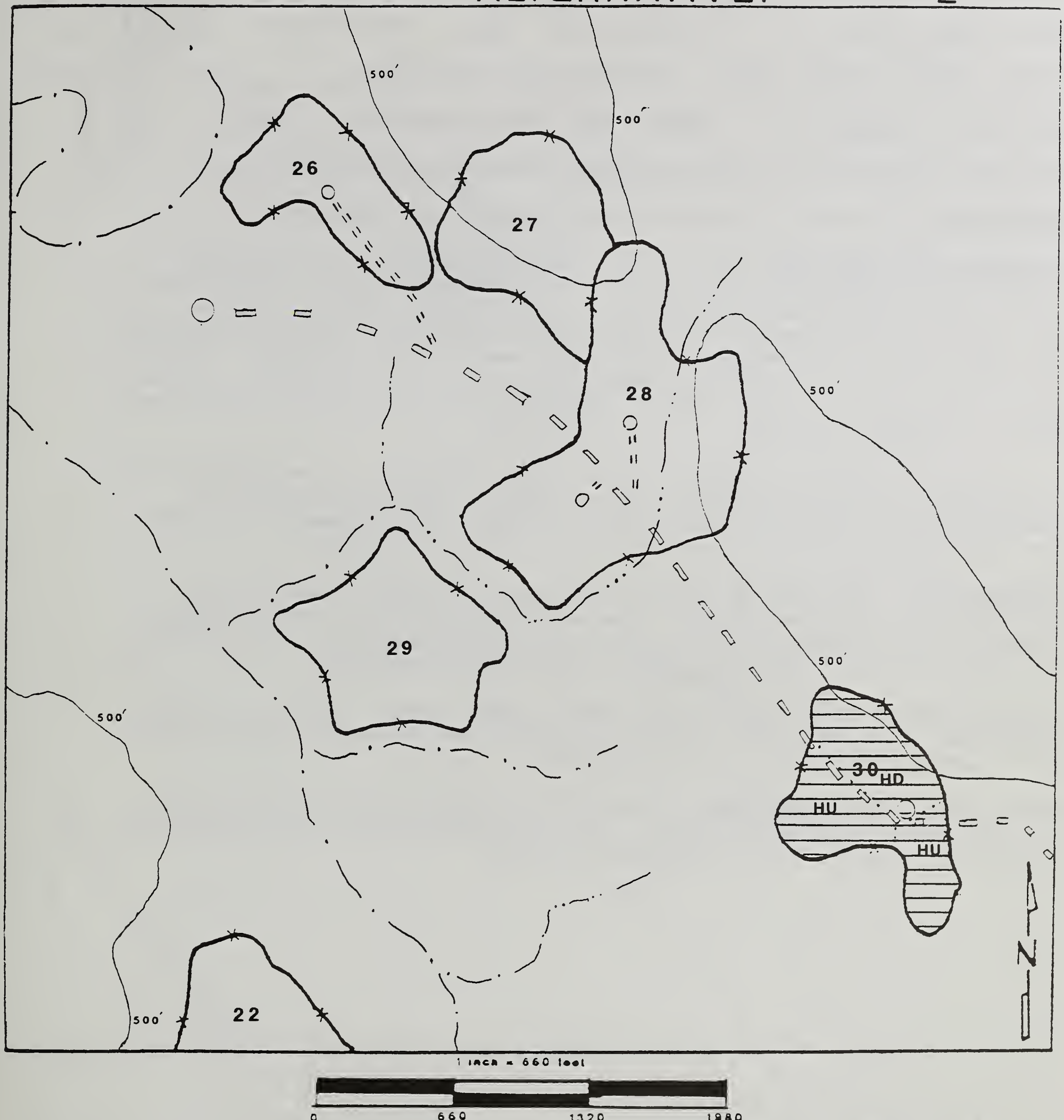
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce or yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an even-aged stand. Establish new stand by harvesting the overstory. Harvest all trees larger than 9 inches in diameter using a cable yarding system. If possible leave a mix of tree sizes in groups along the road to help unit blend into the landscape.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 30 will take two fallers approximately 7 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 30 ALTERNATIVE: E



Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing

Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

Logging System
HD Highlead Downhill
HU Highlead Uphill

CAMPBELL TIMBER SALE UNIT 31 IN ALTERNATIVES E 9" CC

Total Acres 10 Treatment Acres 10 Harvest Acres 10

9" CC Harvest Volume 200 Harvest volume class VC4 10

Elevation: 250-700 feet Aspect: East Site Productivity: High

The plant association is western hemlock/blueberry/spinulose shield fern.

DESCRIPTION: The unit is located in the fresh water influence zone.

DESIRED FUTURE CONDITION: Short term - High-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view.

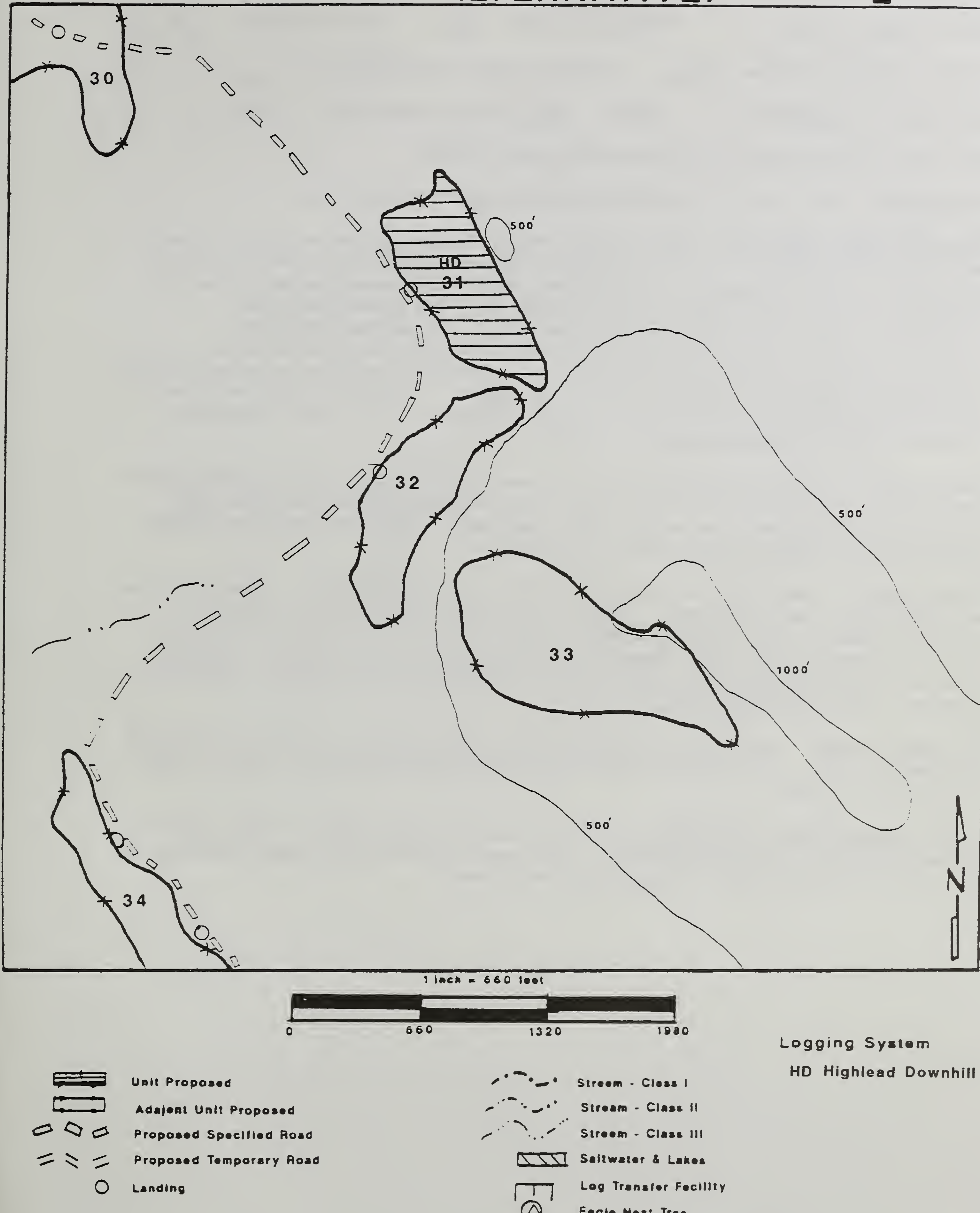
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce or yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an even-aged stand. Establish new stand by harvesting the overstory. Harvest all trees larger than 9 inches in diameter using a cable yarding system. If possible leave a mix of tree sizes in groups along the road to help unit blend into the landscape.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 31 will take two fallers approximately 7 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 31 ALTERNATIVE: E



Logging System
HD Highlead Downhill

CAMPBELL TIMBER SALE UNIT 32 IN ALTERNATIVES E 9" CC

Total Acres 10 Treatment Acres 10 Harvest Acres 10

9" CC Harvest Volume 160 Harvest volume class VC4 10

Elevation: 170-500 feet Aspect: East Site Productivity: Low

The plant association is western hemlock and cliffs.

DESCRIPTION: This unit is located in the interior uplands zone.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Frank Creek visitors will see a more modified landscape. Provide for channel/soil stability. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit may regenerate naturally with a predominance of hemlock.

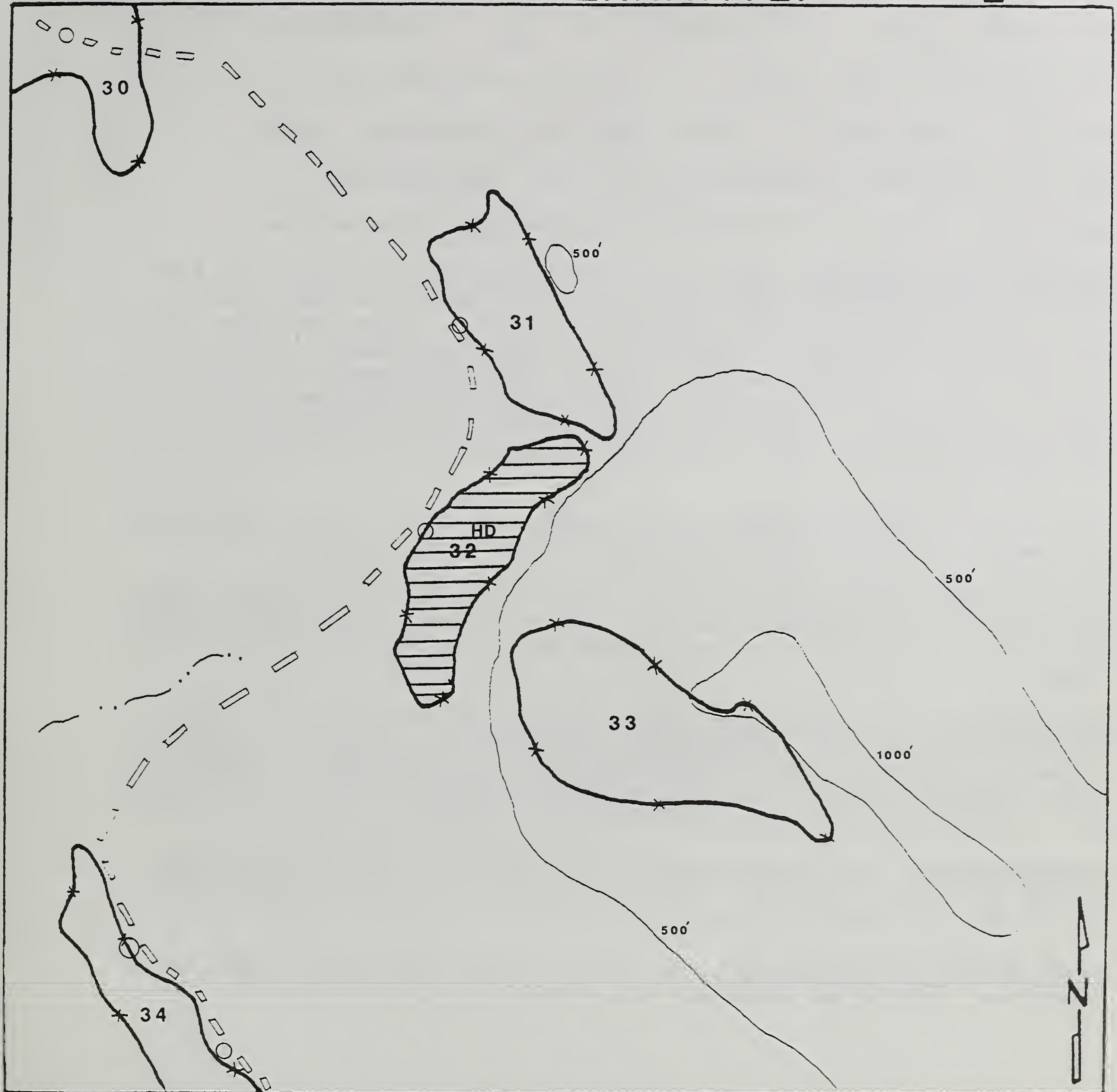
Long term - Increase in productivity for sawlogs and higher value products can be expected. A stand of growing trees, composed most of hemlock with some spruce and yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Stand will be managed as an even aged stand. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave a mix of tree sizes in groups along the road to help unit blend into the landscape if possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 32 will take two fallers approximately 6 days to fall and 5 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 32 ALTERNATIVE: E



1 inch = 660 feet

0 660 1320 1980

Logging System

HD Helicopter Downhill

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 33 IN ALTERNATIVES E 12" OSR

Total Acres 16 Treatment Acres 16 Harvest Acres 16

12" OSR Harvest Volume 320 Harvest volume class VC4 16

Elevation: 520-1,050 feet Aspect: East Site Productivity: High

The plant association is western hemlock-Alaska cedar/blueberry.

DESCRIPTION: This unit is located in the fresh water influence zone.

DESIRED FUTURE CONDITION: Short term - Provide high-quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability. Travel zone for bears and other wildlife. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view. Unit is expected to regenerate naturally with an increase in hemlock.

Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce and yellow cedar as only a minor component.
Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Feather the lower portion of this unit where it is adjacent to Unit 32. Unit should appear as a series of small openings as viewed from the Bradfield Canal.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by road or helicopter. Unit 33 will take two fallers approximately 11 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest to 9 inch limit would not meet visual objectives. Unit is not accessible with a road.

UNIT 33 ALTERNATIVE: E

1 inch = 660 feet

0 660 1320 1980

Logging System

Helicopter

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 34 IN ALTERNATIVES E 9" CC

Total Acres 9 Treatment Acres 9 Harvest Acres 9

9" CC Harvest Volume 189 Harvest volume class VC4 9

Elevation: 150-480 feet Aspect: East Site Productivity: Mod

The plant association is western hemlock and cliffs. UNit is northwest of a lake.

DESCRIPTION: This unit is located in the interior uplands zone.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of forest blocks and maintain wildlife travel corridors to adjacent drainages. Harvest units should mimic natural vegetative patterns. Unit will appear natural from the Bradfield canal. From Frank Creek visitors will see a more modified landscape. Provide for channel/soil stability and no decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

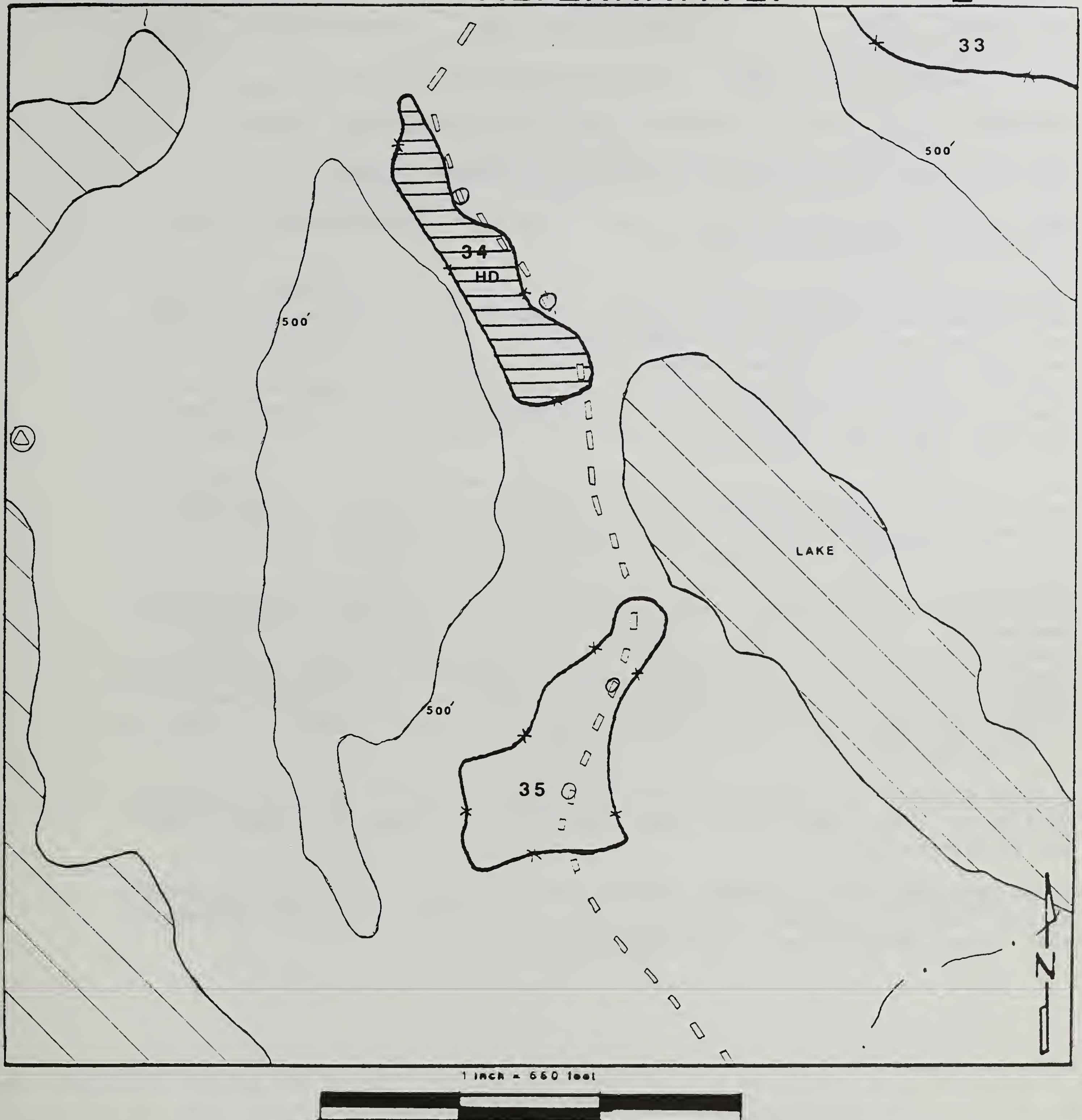
Long term - Increase in productivity for sawlogs and higher value products can be expected. A stand of growing trees, composed most of hemlock with some increase in spruce and yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Stand will be managed as an even aged stand. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave a mix of tree sizes in groups along the road to help unit blend into the landscape if possible. Do not harvest within 100 feet of the lake. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 34 will take two fallers approximately 7 days to fall and 6 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 34 ALTERNATIVE: E



Logging System
HD Highlead Downhill

Unit Proposed
Adajent Unit Proposed
Proposed Specified Road
Proposed Temporary Road
Landing
Stream - Class I
Stream - Class II
Stream - Class III
Saltwater & Lakes
Log Transfer Facility
Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 35 IN ALTERNATIVES E 9" CC

Total Acres 13 Treatment Acres 13 Harvest Acres 13

9" CC Harvest Volume 234 Harvest volume class VC4 13

Elevation: 250-600 feet Aspect: East Site Productivity: Low

The plant association is mixed-conifer/blueberry/skunk cabbage.

DESCRIPTION: This unit is located in the fresh water influence zone. There are no fisheries concerns with this unit.

DESIRED FUTURE CONDITION: Short term - Provide high quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

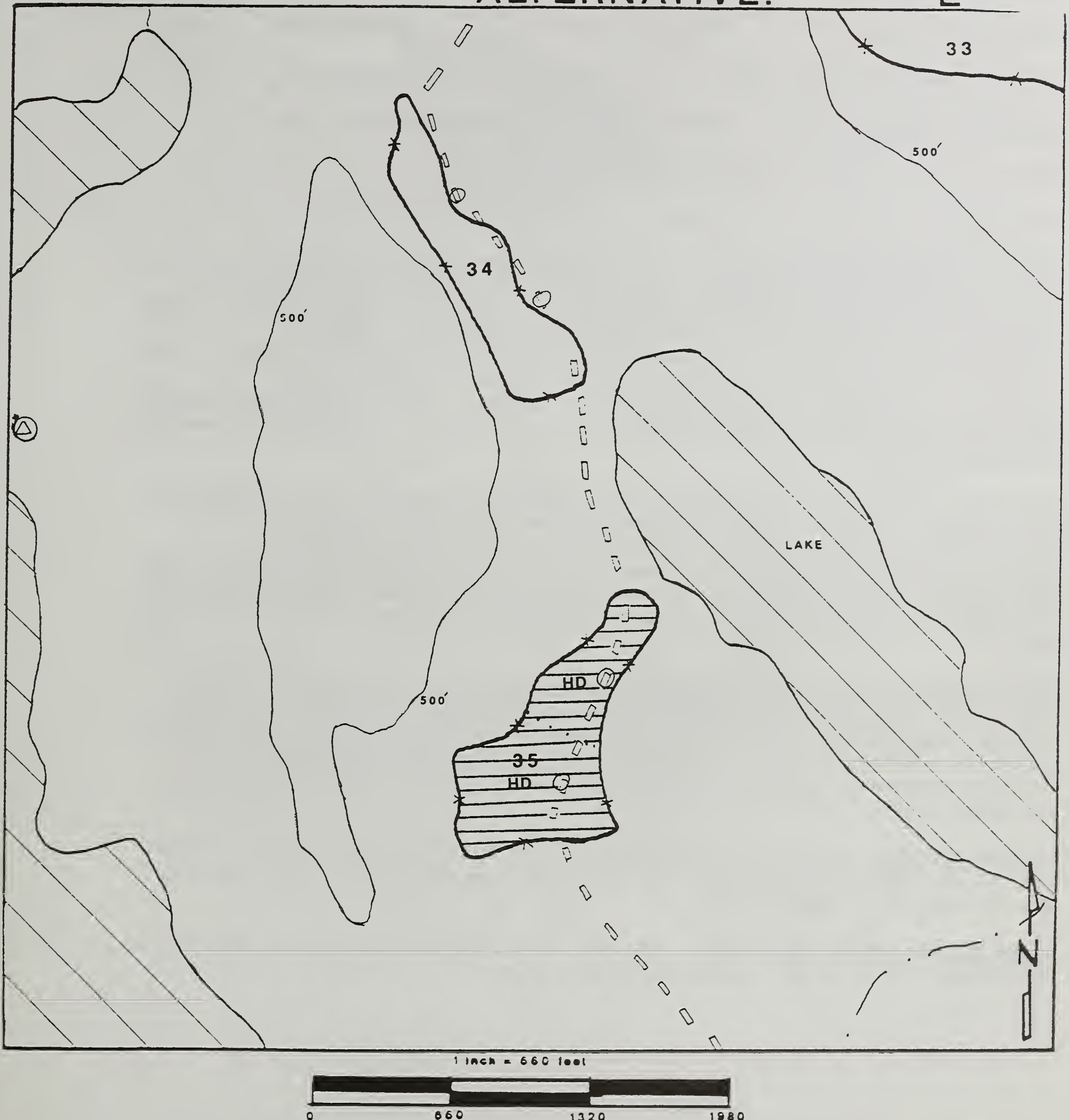
Long term - Increase in productivity for sawlogs and higher value products can be expected. A stand of growing trees, composed most of hemlock with some increase in spruce and yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Stand will be managed as an even aged stand. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave a mix of tree sizes in groups along the road to help unit blend into the landscape if possible. If feasible feather the unitd into the trees above the backline. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 35 will take two fallers approximately 8 days to fall and 14 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 35 ALTERNATIVE: E



Logging System

HD Highlead Downhill

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 36 IN ALTERNATIVES E 12" OSR

Total Acres 13 Treatment Acres 13 Harvest Acres 13

12" OSR Harvest Volume 130 Harvest volume class VC4 13

Elevation: 280-580 feet Aspect: South Site Productivity: Mod

The plant association is western hemlock/blueberry.

DESCRIPTION: - This unit is located in the interior uplands zone.

DESIRED FUTURE CONDITION: Short term - Reduce fragmentation of wildlife travel corridors to adjacent drainages, and harvest units should mimic natural vegetative patterns. Unit will appear natural from the Bradfield Canal. From Frank Creek visitors will see a more modified landscape. Provide forchannel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. No measurable decline in water quality standards. Similar or improved access for humans. Texture change and shape will be visible and will not dominant the view. Unit is expected to regenerate predominately with hemlock.

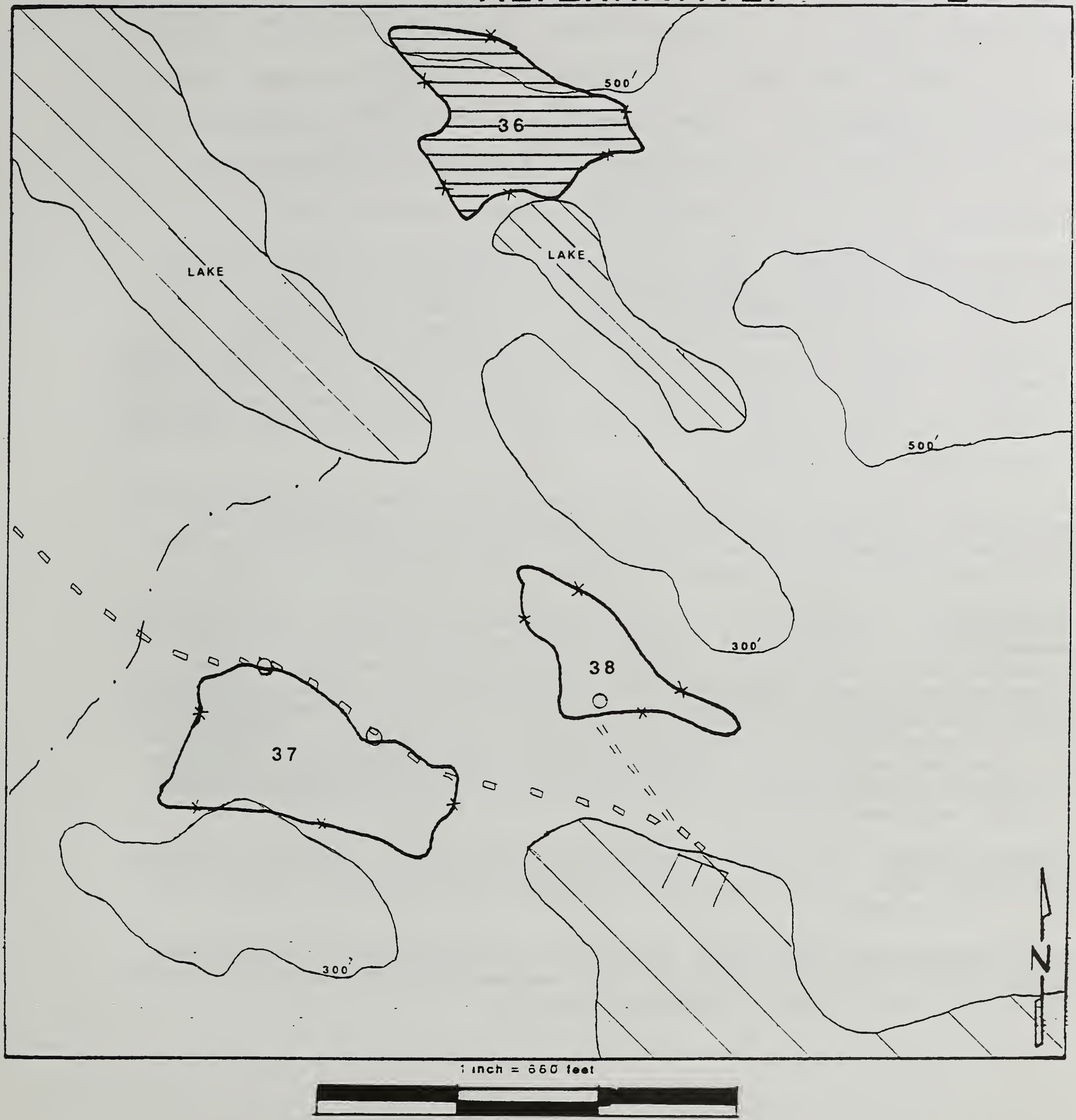
Long term - Increase in productivity for sawlogs and higher value products can be expected. A healthy vigorous growing stand of trees, composed most of hemlock with some spruce and yellow cedar as only a minor component. Unit will have several different canopy layers with several age classes. Unit will provide value to wildlife for snow interception sooner that harvest to 9" tree size. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Unit will be managed as an uneven-aged stand with an extended rotation of 120-150 years. Establish new stand by harvesting the overstory. Harvest trees smaller than 12 inches in diameter only for safety. Unit should appear as a series of small openings as viewed from the Bradfield Canal. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by road or helicopter. Unit 36 will take two fallers approximately 5 days to fall and 2 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest to 9 inch limit would not meet visual objectives. Unit is not accessible with a road.

UNIT 36 ALTERNATIVE: E



Logging System

Helicopter

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 37 IN ALTERNATIVES E 9" CC

Total Acres 16 Treatment Acres 16 Harvest Acres 16

9" CC Harvest Volume 256 Harvest volume class VC4 16

Elevation: 100-330 feet Aspect: North Site Productivity: Low-Mod

The plant association is 13% mixed-conifer and 87% western hemlock cliffs.

DESCRIPTION: This unit is located in the fresh water influence zone.

DESIRED FUTURE CONDITION: Short term - Provide high quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

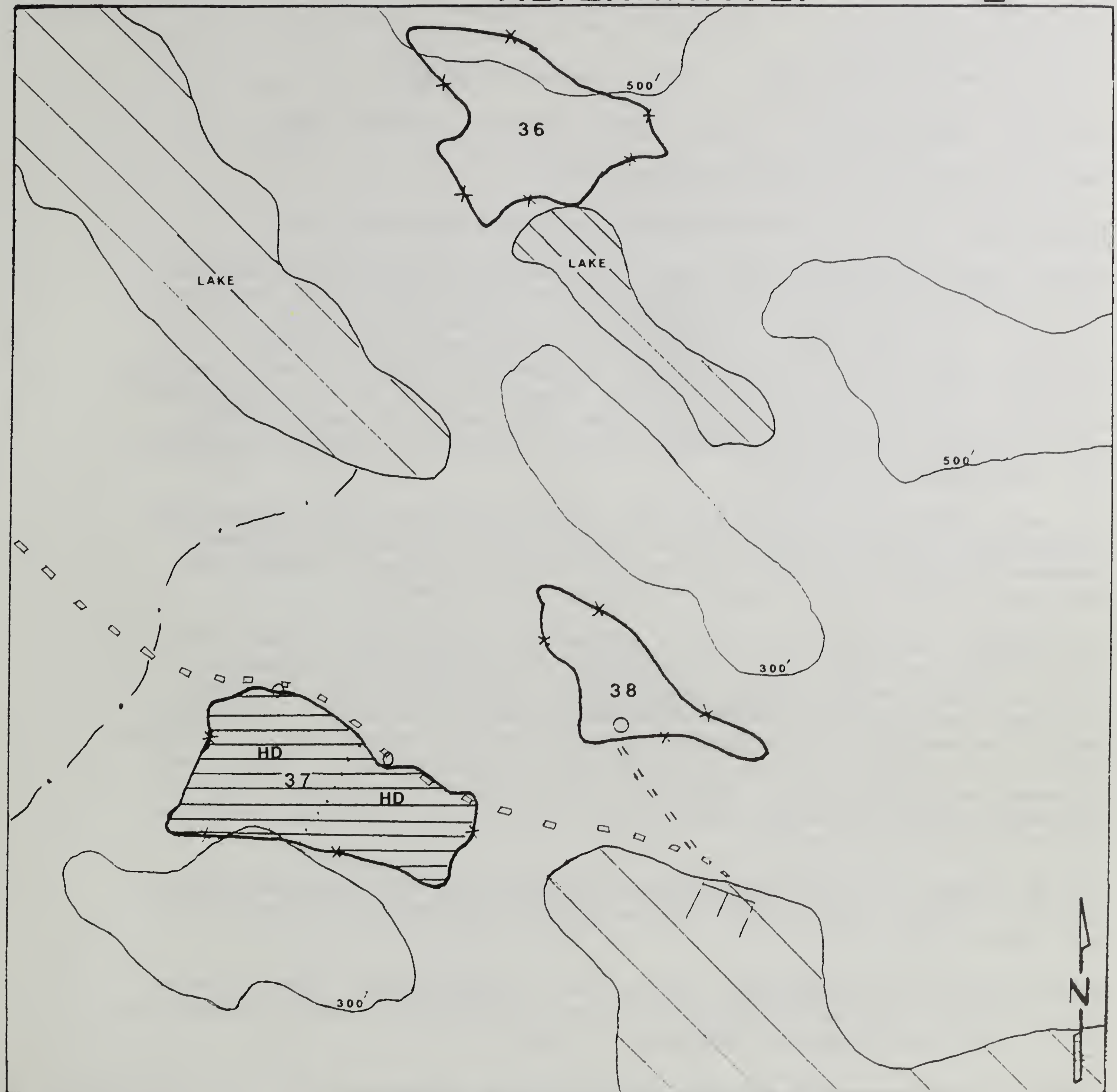
Long term - Increase in productivity for sawlogs and higher value products can be expected. A stand of growing trees, composed most of hemlock with some increase in spruce and yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Stand will be managed as an even aged stand. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave a mix of tree sizes in groups along the road to help unit blend into the landscape if possible. If feasible feather the backline into the remaining trees. Do not harvest trees within the 500 foot beach buffer or within the 1,000 of the estuary buffer. Locate road to access unit outside of the beach and estuary buffer if possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 37 will take two fallers approximately 9 days to fall and 16 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 37 ALTERNATIVE: E



1 inch = 660 feet

0 660 1320 1980

Logging System

HD Highlead Downhill

Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

CAMPBELL TIMBER SALE UNIT 38 IN ALTERNATIVES E 9" CC

Total Acres 7 Treatment Acres 7 Harvest Acres 7

9" CC Harvest Volume 112 Harvest volume class VC4 7

Elevation: 100-280 feet Aspect: East Site Productivity: Mod

The plant association is mixed-conifer series.

DESCRIPTION: This unit is located in the fresh water influence zone.

DESIRED FUTURE CONDITION: Short term - Provide high quality habitat for fish and riparian-associated wildlife species. Provide for channel/soil stability and a travel zone for bears and other wildlife. No decline in slope stability. Any roads constructed will be on stable areas with minimum sediments impacts to the water quality. No measurable decline in water quality standards. Similar or improved access for humans and some change of the visual character of the fresh water influence zone. Texture change and form shape will be visible and will not dominant the view. Unit will regenerate naturally with a predominance of hemlock.

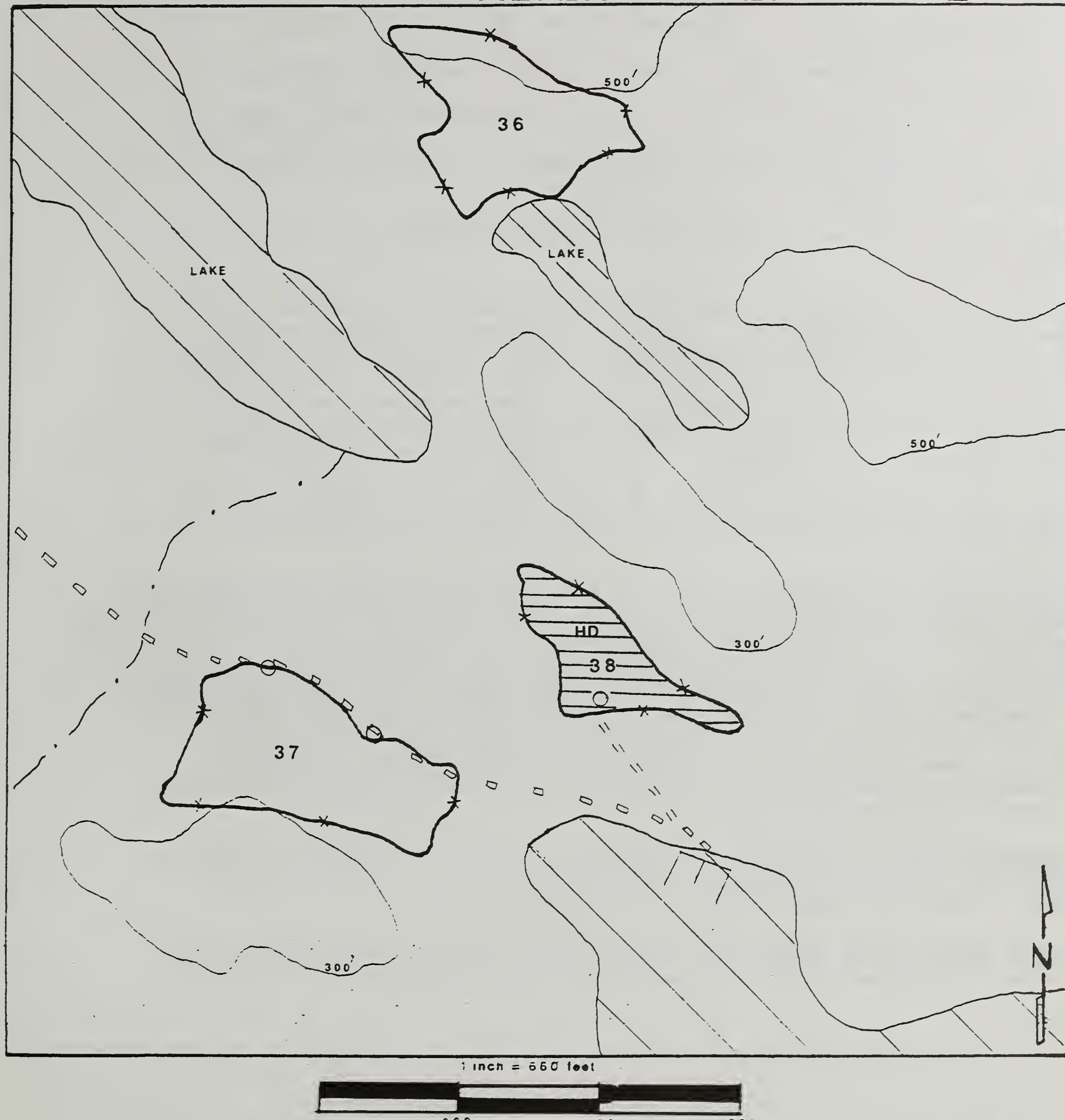
Long term - Increase in productivity for sawlogs and higher value products can be expected. A stand of growing trees, composed most of hemlock with some increase in spruce and yellow cedar as only a minor component. Branches and tops should return to pre-logging conditions in 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory. Stand will be managed as an even aged stand. Harvest all trees larger than 9 inches in diameter using a cable yarding system. Leave a mix of tree sizes in groups along the road to help unit blend into the landscape if possible. If feasible feather the backline into the remaining trees. Do not harvest trees within the 500 foot beach buffer or within the 1,000 of the estuary buffer. Locate road to access unit outside of the beach and estuary buffer if possible. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a cable system. Access for falling will be by road. Unit 38 will take two fallers approximately 4 days to fall and 4 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit in small groups. This rejected as not feasible with cable yarding. Unit was considered for shovel yarding and this is not feasible due to topography and slope.

UNIT 38 ALTERNATIVE: E



Unit Proposed

Adajent Unit Proposed

Proposed Specified Road

Proposed Temporary Road

Landing

Stream - Class I

Stream - Class II

Stream - Class III

Saltwater & Lakes

Log Transfer Facility

Eagle Nest Tree

Logging System

HD Highlead Downhill

CAMPBELL TIMBER SALE UNIT 40 IN ALTERNATIVES G 9" GS

GS Total Acres 82 Treatment Acres 82 Harvest Acres 20

9" GS Harvest Volume 240 Harvest volume class VC4 18 ac VC5 2 ac

Elevation: 220-1,200 feet Aspect: South Site Productivity: Mod

Plant association is 62% western hemlock-Alaska cedar/blueberry and 48% mixed-conifer series.

DESCRIPTION: This unit is located in the saltwater facing zone adjacent to the beach fringe.

DESIRED FUTURE CONDITION: Short term - Maintain migration corridors up and down slope between goat winter range and summer range. Visitors to the Bradfield Canal will notice harvest units and the unit will appear natural. After harvest units will appear to have a texture change from the surrounding areas and unit is predicted to meet partial retention visual quality objective. Straight lines and large opening will not be visible from saltwater. Unit will regenerate naturally with a predominance of hemlock.

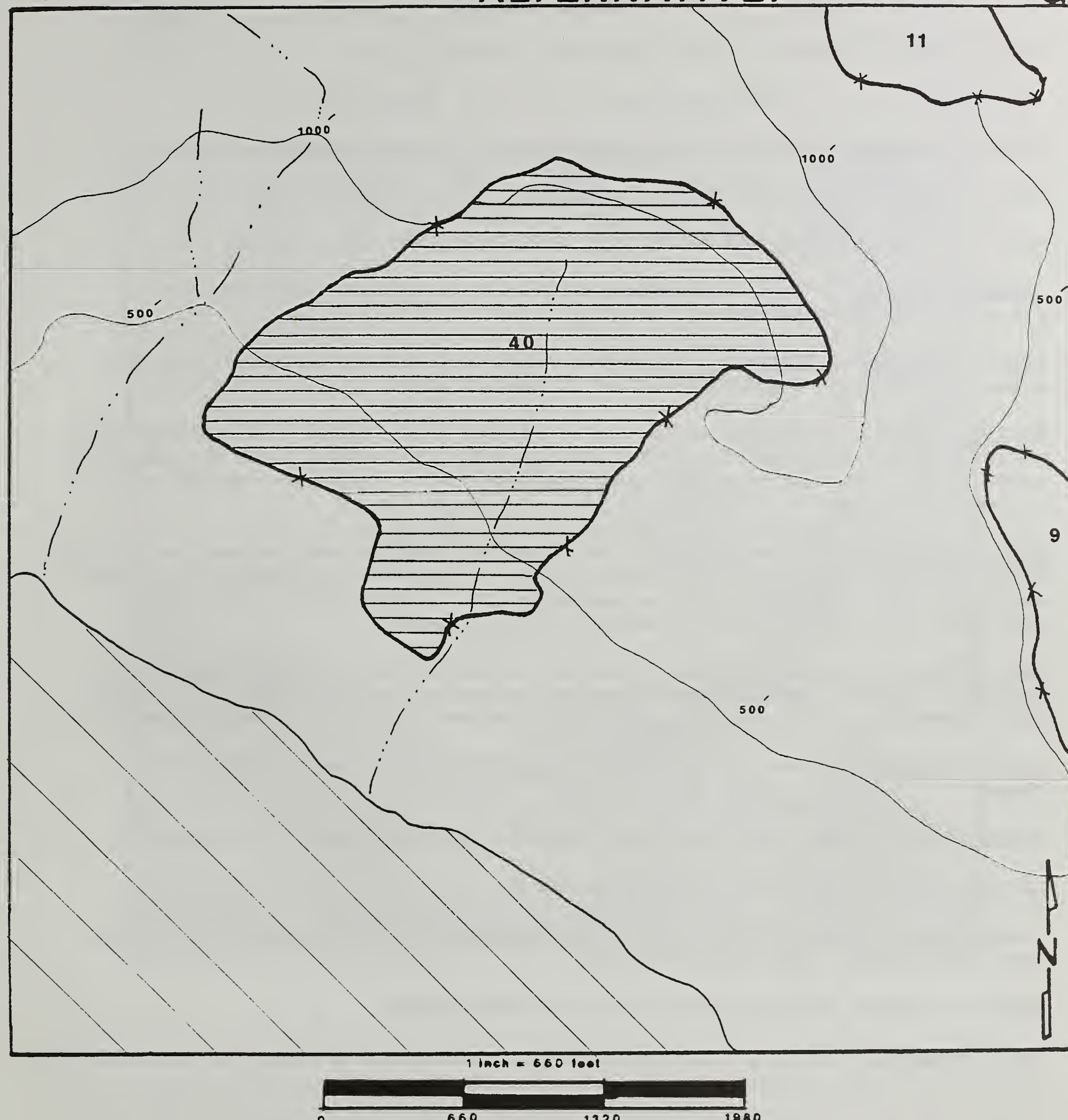
Long term - Increase productivity for sawlogs and higher value products is expected. Tops and branches are expected to return to pre-logging conditions on 20-30 years.

PRESCRIPTION: Establish new stand by harvesting the overstory and manage as an uneven-aged stand multi-storied patchy stand with trees in several age classes with an extended rotation of 120-150 years. Provide an irregularly shaped unit boundary. Harvest the stand with small groups that average 2 acres in size. and harvest no more than 25% (20 acres) of the stand. Uncut areas will provide for migration between beach fringe and upslope areas. Vary edges and backline to blend with the landscape. No harvest of timber within 500 foot of the beach. Leave as many cull trees standing as safety permits. Possible treatments include planting, shrub control, precommercial thinning, porcupine control, and a sanitation cut.

LOGGING SYSTEMS: Unit will be yarded with a helicopter. Access for falling will be by walking or helicopter. This unit will take two fallers about 8 days to fall and 3 days to yard.

OTHER PRESCRIPTIONS CONSIDERED: Harvest unit taking all trees larger than 9 inches in diameter. This is rejected as not meeting objectives of visuals.

UNIT 40 ALTERNATIVE: G



Logging System
Helicopter

Unit Proposed	Stream - Class I
Adajent Unit Proposed	Stream - Class II
Proposed Specified Road	Stream - Class III
Proposed Temporary Road	Saltwater & Lakes
Landing	Log Transfer Facility
	Eagle Nest Tree

PLANNED ROAD CARD

PROJECT NAME:___Campbell, Frank Creek Road_ MGT AREA:__S31______ VCU:__510_____

ROAD NUMBER:________ FUNCTIONAL CLASS:___________ ENTRY CYCLE:________________

LENGTH:__1.3_______ TRAFFIC SERVICE LEVEL:________ DESIGN SPEED:______________

DESIGN VEHICLE:_Log Truck_ CRITICAL VEHICLE:_________ HIGHWAY SAFETY ACT:______

MAINTENANCE LEVELS: (ACTIVE SALE)______ POST SALE: Closed, Put to Bed

INTENDED PURPOSE: To provide access for timber management activities and forest service administration.

TRAFFIC MANAGEMENT STRATEGY:_ Close the roads by trenching and or placing mineral and organic debris on road bed in certain areas.

EROSION CONTROL: All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 14.8 E1). At point B build a bulkwork on lower side of the road to prevent sluffing into the ck. below and endhaul all excavated material.

ROAD LOCATION: Point A would have a rock ramp for water access. Between point A and B the road should be into the hillside as far as possible to prevent construction on the beach. There should be minimum excavation due to blue clay in this area. Facilitate Road closure through design of first segment.

ROCK PITS: Pit A may have visual concerns. During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspened_____ near potentially unstable sites where vibration may induce mass movement(BMP 14.18 E1

STREAM CROSSINGS:_There are 5 stream crossings which will require a 36" cmp or larger.

FUTURE NEEDS: None, road should be closed to motorized traffic including ATV

VEGETATIVE MGT: Use minimum clearing widths.

TIMING RESTRICTIONS: On all fish streams there shall be a timing window for any road construction. (BMP 12.6 thru 13.3)

MONITORING NEEDS: Monitor effectiveness of road closure.

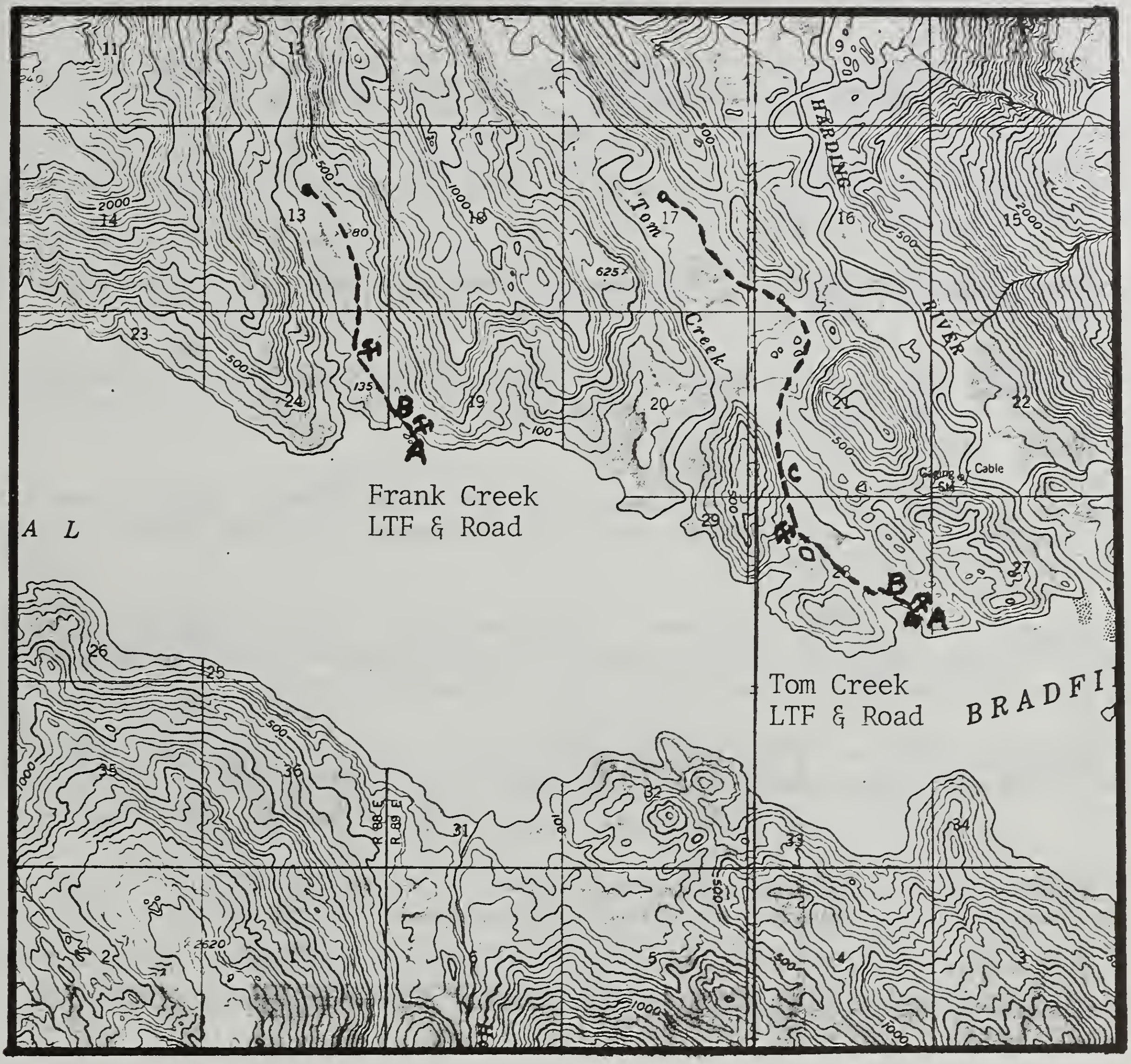
CONSIDERATIONS:____

I.D. TEAM:____

Recommended By:_______________________________Date:________________

Interdisciplinary Leader

PLANNED ROAD CARD MAP AND PHOTO------------------ ROAD NUMBER___TOM CK.___



MAP SCALE:1"=__5280 FT__ PHOTO SCALE:1"=__________

AERIAL PHOTOS: YEAR_______ FLIGHT LINE______ PHOTO #s__________________

LEGEND:

EXISTING ROAD	MAJOR CULVERT	GATE
PLANNED ROAD — — —		LOG TRANSFER
TEMPORARY ROAD	ROCK PIT ⚒	BRIDGE

PLANNED ROAD CARD

PROJECT NAME: Campbell, Tom Creek Road MGT AREA: S31 VCU: 510

ROAD NUMBER: ________ FUNCTIONAL CLASS: ___________ ENTRY CYCLE: ________________

LENGTH: 3.3 TRAFFIC SERVICE LEVEL: ________ DESIGN SPEED: ______________

DESIGN VEHICLE: Log Truck CRITICAL VEHICLE: _________ HIGHWAY SAFETY:

MAINTENANCE LEVELS: (ACTIVE SALE) ______ POST SALE: _____

INTENDED PURPOSE: To provide access for timber management activities and forest service administration.

TRAFFIC MANAGEMENT STRATEGY: Close the roads by trenching and or placing mineral and organic debris on road bed in certain areas.

EROSION CONTROL: All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 14.8 E1). Areas a to b may need to be endhauled.

ROAD LOCATION: Point A would have a rock ramp for water access. Typical construction_ except at point C which has approx. 50 ft. of fullbench rock cut on the edge of the lake. See considerations below.

ROCK PITS: Pit A has visual concerns. During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspened near potentially unstable sites where vibration may induce mass movement(BMP 14.18 E1

STREAM CROSSINGS: Due to fisheries potenial oversize and install CMP on lake outlet at a low gradient. There are 7 stream crossings which will require a 36" cmp or larger.

FUTURE NEEDS: None, clsoe road to all mortorized traffic including ATV

VEGETATIVE MGT: Use minimum clearing widths.

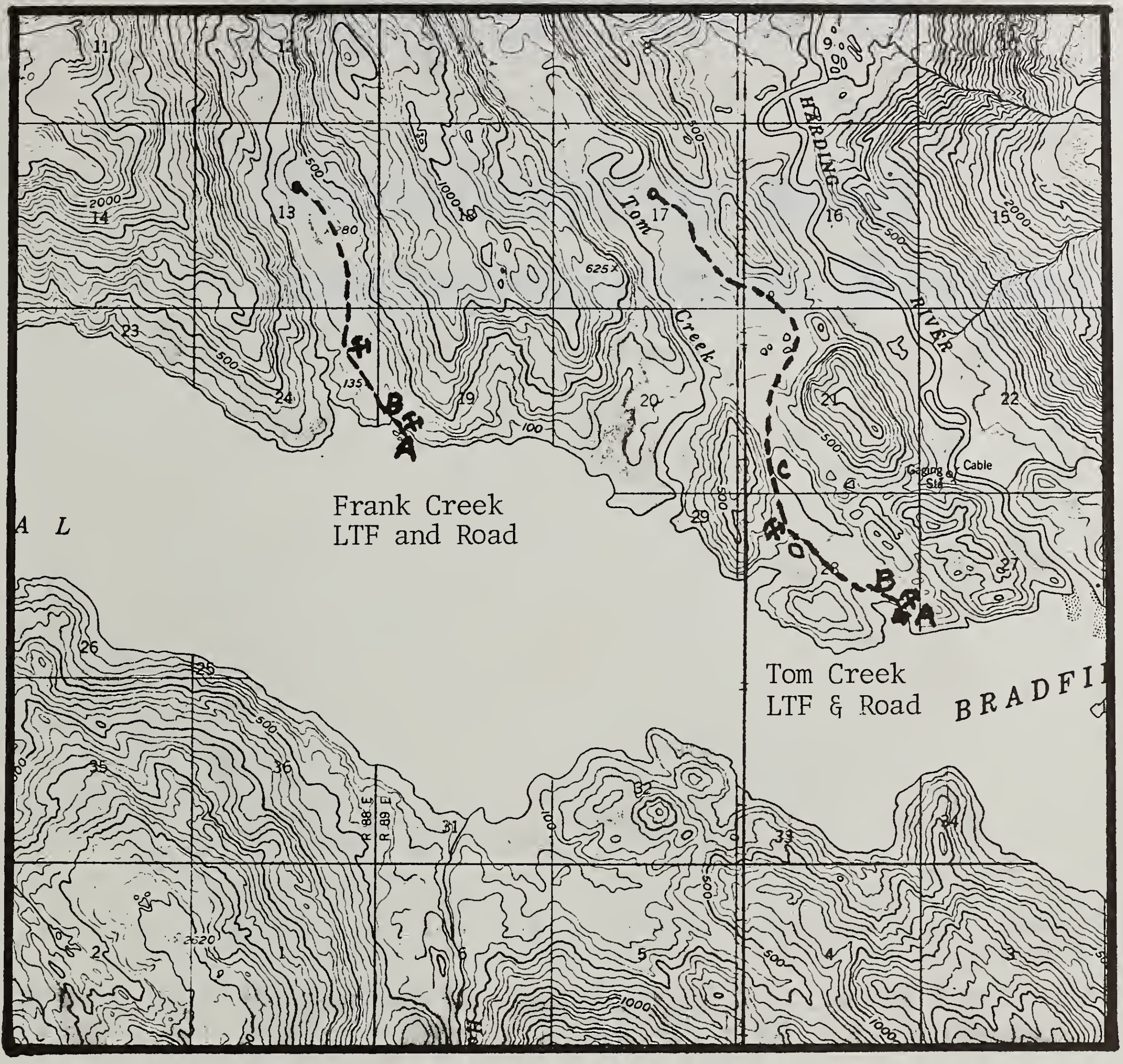
TIMING RESTRICTIONS: On all fish streams there shall be a timing window for any road construction (BMP 12.6 thru 13.3)

MONITORING NEEDS: Monitor effectiveness of road closures.

CONSIDERATIONS: HIGH HAZARD SOILS: GIS identifies three segments of the road that traverse high hazard areas. The first is located near the lake. Road will be built on a 50 foot bench with 10% sideslopes immediately adjacent to lake. 50 feet of this construction will need to be full bench. Second area lies adjacent to high hazard. Road will be located in muskeg. Third area is on 50% sideslopes. Construct full bench with endhaul construction.
E1)
I.D. TEAM: ____

Recommended By: ________________________________ Date: ______________
Interdisciplinary Leader

PLANNED ROAD CARD MAP AND PHOTO------------------- ROAD NUMBER___TOM CK._



MAP SCALE:1"=__5280 FT__ PHOTO SCALE:1"=___________

AERIAL PHOTOS: YEAR_______ FLIGHT LINE______ PHOTO #s________________________

LEGEND:

EXISTING ROAD	MAJOR CULVERT	GATE
PLANNED ROAD ———		LOG TRANSFER
TEMPORARY ROAD	ROCK PIT ⚒	BRIDGE

Appendix B

Monitoring and Improvement Projects

Monitoring

Monitoring is designed to determine if resource objectives have been met. Monitoring helps us measure how well the predictions we made were realized and if we achieved the desired results. The following is a list of monitoring projects we are considering if an action alternative is selected by the Forest Service.

Effectiveness of Stream Buffers- We will determine if the buffers left along streams were effective and did not blowdown. Buffers will be flown and field measurements would be made as necessary to determine the extent and direction of blowdown if any occurs. Buffers would be flown during the spring of each year and cost $1,000 per year.

BMP Implementation- Determining if Best Management Practices have been implemented is a Forest-wide program to ensure compliance. Any units or roads implemented would go into a unit and road pool at the forest level where a random sample of 20% of the Stikine Area units and roads are selected for monitoring. This activity occurs once after the activity is complete and the information is incorporated into the Stikine Area BMP Monitoring Report. Costs are variable and funding is part of routine work.

Effectiveness of Road Closures and Use By Public- Little information is available on the effective methods of reducing vehicle traffic or increased access or recreation opportunities resulting from closed roads. If a roaded alternative is selected, the effective closure of these roads following harvest will be monitored to determine what kinds of use and how much use is occurring along the road. Visual observations of use, tracks and counters will be used to measure use for two years after closure. Periods of monitoring would be random throughout the year but distributed throughout potential use seasons. Costs are estimated to be $3,500 per year.

Use of the Areas Resources by Personnel- Little information is currently available about the use of the resources in an area by personnel (contract and administrative) associated with a timber sale. This monitoring project is being considered in order to determine the extent and types of use of the area by personnel before and during logging operations. Methods have not been developed.

Implementation, Effectiveness and Validation of Overstory Removal Harvest Methods- Under an action alternative we would monitor if harvest prescriptions were implemented according to information contained on the unit cards. We would also put in a number of permanent plots in the units before harvest and measure certain parameters before and after implementation. These plots could then be measured over time as funding becomes available. After harvest, we would visit the site and evaluate this information to determine if we achieved our desired objectives of these prescriptions and if this is a valid practice for managing other lands. This bulk of this monitoring would take place before and within the first two years after harvest. Estimated costs are $6,000 per year.

LTF Bark Accumulation- This monitoring would determine the size of the area affected by bark deposition. If LTF sites are implemented they will be dove once during the permit period.

Regeneration Surveys- These surveys are routine surveys conducted during the first and thirds years after harvest to determine if adequate trees are regenerating or releasing in harvested units. Recommendations for planting trees are based on these surveys and ensure that the units are adequately "stocked" with trees within five years.

Potential Improvement Projects

If an action alternative is selected these projects may be listed in the Campbell Timber Sale Area Improvement Plan. All projects comply with Forest Service K-V Handbook direction (FSH 2409.19). K-V funding for projects other than Regeneration Surveys and Tree Planting would be dependent on the amount of sale revenues. The following projects are **not** listed in order of K-V funding priority.

Natural Regeneration Surveys- These surveys identify the amount of natural regeneration established after harvest.

Tree Planting- Harvested stands which are not expected to receive adequate regeneration will be planted. Units which have a higher probability of needing planting are identified on unit cards.

Fishery Enhancement- An opportunity for enhancement exists in the upper Tom Creek drainage. Modification of small falls by blasting could provide access for steelhead and coho to approximately 2.5 miles of spawning and rearing habitat.

The substrate of the lower two-thirds of Tom Creek is noticeably uniform and the channel contains few large gravel-cleaning and pool-scouring instream objects such as logs, rootwads, and boulders. There is the potential to insert such structural elements into the channel in order to create more varied habitat. At a minimum, the coarse objects would provide and create cover. Large boulders would be preferable to large wood because it appears wood is carried downstream by ice flows. Rock could be blasted where the stream goes near rock bluffs or boulders could be transported by helicopter.

First- and second-order tributaries along the east side of the lower 1 mile of Tom Creek provide limited rearing and overwintering habitat but may provide critical refuge during floodflows and ice flows. Although beaver inhabit this reach, no active beaver dams have been found in these streams. Rearing capacity of these tributaries could conceivably be increased by installing log structures which would impound water behind them, but still allow ingress and egress by various age classes. The duration of effectiveness could be reduced below normal due to the natural erosion of deep fine-textured deposits which the streams drain.

Wildlife Travel Corridors- There may be some potential to experiment with establishing slash free corridors for elevational wildlife migration under some alternatives. These would be established by clearing slash in long units that run perpendicular to the contours. The effectiveness of these corridors would also be evaluated.

Information Brochure- A brochure could be developed which explains some of the natural, geologic and management features of the Bradfield Area.

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